



Process analytics

Product overview

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KROHNE – your global partner

KROHNE is your reliable partner for process instrumentation and automation. As our client, you benefit from our ability to solve your applications with matching measurement solutions; we offer a complete product portfolio, industry specific system solutions and complementary services for instrumentation projects of any size.

By having specialised in industrial process measurement since 1921, we have gained an enormous amount of application knowledge in various industries that is integrated into our products, solutions and services. We have truly mastered the physical principles our meters are based on: our ability to utilise physical effects and to find a matching measuring solution time after time are the reasons we are trusted by clients worldwide. The primary measured value is as accurate as possible to avoid consecutive faults that might affect your process control. It also enables our meters to measure reliably, even under changing or difficult process conditions. Both aspects are reflected by our claim "Measure the facts".

The innovative technologies we employ for your benefit are based on our extensive R&D activities: 10% of the more than 4000 KROHNE employees work in research and development. Next to sensor physics, their focus is on device communication and enabling technologies for the Internet of Things (IoT) in process industry, e.g. ethernet communication to transmit process and device diagnostic data for evaluation and process optimisation.

Our "Technology Icons" perfectly sum up the above mentioned advantages for you. You will find them highlighted within our complete portfolio in this brochure. If you don't find a matching solution for your measurement application, feel free to contact us, we look forward to solving it.



From analysis to the solution – Process analytics

KROHNE is your partner for all aspects of analytical instrumentation, from pH measurement in hazardous areas to sludge level and sedimentation measurement on wastewater treatment plants.

We offer a comprehensive portfolio of liquid analytical sensors with and without integrated transmitter, complete measuring systems as well as installation equipment, transmitters and accessories to match the requirements of various industries.

Our main goals are attaining sturdiness, reliability and quality in the various application areas. We will gladly assist you in the search for the optimum solution to your measurement task. Should it be necessary to specifically design a measuring system according to your requirements, we are able to modify our systems in line with your needs and include additional components.

KROHNE analytical portfolio

Sensors

Based on different physical, electrochemical and optical effects, liquid analytical sensors measure water quality parameters such as pH, ORP, conductivity, TSS, turbidity, dissolved oxygen and various others.

KROHNE offers an extensive portfolio of analytical sensors: each sensor is specifically designed for its area of application; the respective approvals, certificates and process connections range from hazardous (zone 0) to hygienic areas.

Next to the OPTISENS series for "traditional" use with an external transmitter, KROHNE offers the SMARTPAT series with integrated transmitter. Introduced in 2013, SMARTPAT is the first sensor series with built-in fieldbus communication and current output: any SMARTPAT sensor can be connected directly to the process control system via 4...20 mA/HART[®] 7. For offline calibration, the sensor can be connected to a PC running with PACTware[™] (FDT/DTM).

Systems

Liquid analytical measuring systems are preconfigured combinations of sensor(s), transmitter, mounting assembly or process connections, specially designed for a certain area of application.

From potable water disinfection, sludge monitoring in wastewater treatment plants, to quality control in dairies, breweries or beverage production – KROHNE offers a wide range of analytical measuring systems for:

- Chlorine and turbidity analysis
- Hygienic conductivity and total suspended solids measurements
- Monitoring of sludge blanket level and sedimentation

Assemblies, transmitters and operating units, accessories

KROHNE offers a large variety of installation equipment for analytical sensors for use in harsh environments, hazardous areas, hygienic or other applications. Transmitters and operating units for liquid analytical sensors provide a convenient on-site access to sensor readings and parameterisation.

A wide range of accessories enables the convenient use and handling of liquid analytical sensors in the plant.

Product selection list: pH

		SMART	TPAT pH sensors w	vith integrated tran	smitter	
	SMARTPAT pH 8150 chemical	SMARTPAT pH 8530 pure water	SMARTPAT pH 8570 hygienic	SMARTPAT pH 8320 water/ wastewater	SMARTPAT pH 2390 process/ wastewater	SMARTPAT pH 1590 water/ wastewater
Page	22	22	22	22	22	22
Installation/size	PG 13.5/ Ø12 mm	PG 13.5/ Ø12 mm	PG 13.5/ Ø12 mm	PG 13.5/ Ø12 mm	3/4" NPT	3/4" NPT
Clean/treated water						
Pure water (steam preparation, condensate, semicon- ductor industries)	-	x	-	-	-	-
Pharmaceutical water	-	х	0	-	-	-
Partially demineralised water	0	х	0	0	0	0
Potable water	0	0	0	х	0	х
Surface water						
Natural waters	0	0	-	х	0	х
Sea water	0	-	-	х	0	х
Waters in process industrie	es					
Cleaning and rinsing	х		0	0	x	0
Brine, salt solutions	х		0	0	x	0
Acids and bases	х	-	0	0	x	0
Neutralisation processes	х	-	0	0	x	0
Water loaded with reagents or products	х	-	0	0	x	0
Hygienical process waters						
Food and beverage	-	_	x	-	-	-
Milk processing	-	_	x	-	-	-
Brewing waters	-	_	х	-	-	-
Lemonades, wines, soda water	-	-	х	-	-	-
CIP and SIP processes	-		х	-	-	-
Fermenters	0	-	х	-	-	-
Wastewater treatment						
Sewer and inlet water	0		-	х	x	0
Aeration tank/basin	0	-	-	х	x	0
Clarifier/settling basin	0	-	-	x	x	0
Outlet	0	-	-	х	x	0
Sludge	0	-	-	x	x	0
Sludge from minerals and mining processes	0	_	-	x	x	0
Industrial wastewater	0	_	_	x	x	0
Approvals						
ATEX, IECEx, FM, CSA, QPS, NEPSI	x	-	x	x	-	-

	OPTISENS pH sensors (analogue)						
	OPTISENS pH 8100 chemicals/ pure water	OPTISENS pH 8300 waste- water and more	OPTISENS pH 8500 water/ wastewater	OPTISENS pH 9100, 9500 pure water	OPTISENS pH 8390 water/ wastewater	OPTISENS pH 8590 water/ wastewater	
Page	23	23	23	23	23	23	
Installation/size	PG 13.5/ Ø12 mm	PG 13.5/ Ø12 mm	PG 13.5/ Ø12 mm	PG 13.5/ Ø12 mm	3/4" NPT	3/4" NPT	
Clean/treated water							
Pure water (steam preparation, condensate, semicon- ductor industries)	x	-	-	0	-	-	
Pharmaceutical water	x	-	-	о	-	-	
Partially demineralised water	x	0	0	x	0	0	
Potable water	0	0	х	0	0	х	
Surface water							
Natural waters	0	x	0	0	х	0	
Sea water	-	х	0	-	x	0	
Waters in process industri	ies						
Cleaning and rinsing	х	0	-	-	х	0	
Brine, salt solutions	х	0	0	-	x	0	
Acids and bases	х	0	0	-	х	0	
Neutralisation processes	х	0	0	-	x	0	
Water loaded with reagents or products	x	0	0	-	x	0	
Hygienical process waters	5						
Food and beverage	-	-	-	-	-	-	
Milk processing	-	-	-	-	-	-	
Brewing waters	-	0	-	-	-	-	
Lemonades, wines, soda water	-	0	-	-	-	-	
CIP and SIP processes	-	-	-	-	-	-	
Fermenters	-	-	-	-	-	-	
Wastewater treatment							
Sewer and inlet water	-	x	0	-	х	0	
Aeration tank/basin	-	X	0	-	х	0	
Clarifier/settling basin	-	x	0	-	x	0	
Outlet	-	X	0	-	x	0	
Sludge	-	X	0	-	x	0	
Sludge from minerals and mining processes	-	x	0	-	x	0	
Industrial wastewater	-	х	0	-	х	0	
Approvals							
ATEX, IECEx, FM, CSA, QPS, NEPSI	-	-	-	-	-	-	

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Product selection list: ORP

	SMARTPAT 0	RP sensors with integrate	ed transmitter
	SMARTPAT ORP 8150 chemical	SMARTPAT ORP 8510 water	SMARTPAT ORP 1590 water/wastewater
Page	22	22	22
Installation/size	PG 13.5/Ø12 mm	PG 13.5/Ø12 mm	3/4" NPT
Clean/treated water			
Pure water (steam preparation, condensate, semiconductor industries)	_	_	-
Pharmaceutical water	-	-	-
Partially demineralised water	0	-	-
Potable water	0	x	x
Surface water			
Natural waters	0	x	х
Sea water	0	-	0
Waters in process industries			
Cleaning and rinsing	х	-	х
Brine, salt solutions	0	-	х
Acids and bases	х	-	х
Neutralisation processes	х	-	х
Water loaded with reagents or products	х	-	х
Hygienical process waters			
Food and beverage	-	-	-
Milk processing	-	-	-
Brewing waters	-	-	-
Lemonades, wines, soda water	-	-	-
CIP and SIP processes	-	-	-
Fermenters	0	-	-
Wastewater treatment			
Sewer and inlet water	0	-	0
Aeration tank/basin	0	-	0
Clarifier/settling basin	0	-	0
Outlet	0	-	0
Sludge	0	-	0
Sludge from minerals and mining processes	0	_	0
Industrial wastewater	0	-	0
Approvals			
ATEX, IECEx, FM, CSA, QPS, NEPSI	x	-	-

	OPTISENS ORP sensors (analogue)				
	OPTISENS ORP 8500 water/wastewater	OPTISENS ORP 8590 water/wastewater			
Page	23	23			
Installation/size	PG 13.5/Ø12 mm	3/4" NPT			
Clean/treated water					
Pure water (steam preparation, condensate, semiconductor industries)	-	-			
Pharmaceutical water	-	-			
Partially demineralised water	0	-			
Potable water	x	x			
Surface water					
Natural waters	x	x			
Sea water	-	0			
Waters in process industries					
Cleaning and rinsing	0	х			
Brine, salt solutions	-	Х			
Acids and bases	-	х			
Neutralisation processes	-	х			
Water loaded with reagents or products	-	х			
Hygienical process waters					
Food and beverage	-	-			
Milk processing	-	-			
Brewing waters	0	-			
Lemonades, wines, soda water	-	-			
CIP and SIP processes	-	-			
Fermenters	-	-			
Wastewater treatment					
Sewer and inlet water	0	х			
Aeration tank/basin	Х	х			
Clarifier/settling basin	х	х			
Outlet	-	Х			
Sludge	-	х			
Sludge from minerals and mining processes	-	x			
Industrial wastewater	-	x			
Approvals					
ATEX, IECEx, FM, CSA, QPS, NEPSI	_	-			

Т

x = best selection, o = suitable, - = not suitable

Product selection list: Conductive conductivity

	SMARTPAT 2-electrode sensors with integrated transmitter						
	SMARTPAT COND 1200 water/ wastewater	SMARTPAT COND 3200 pure water	SMARTPAT COND 5200 chemical	SMARTPAT COND 7200 hygienic			
Page	30	30	30	30			
Clean/treated water							
Pure water (steam preparation, condensate, semiconductor industries)	-	x	-	0			
Pharmaceutical water	-	0	-	x			
Partially demineralised water	-	х	-	0			
Potable water	x	0	0	х			
Surface water							
Natural waters	x	0	0	-			
Sea water	-	-	-	-			
Waters in process industries							
Cleaning and rinsing	х	0	0	-			
Brine, salt solutions	0	-	0	-			
Acids and bases	0	-	х	-			
Neutralisation processes	0	-	х	-			
Water loaded with reagents or products	0	-	х	-			
Hygienical process waters							
Food and beverage	-	-	-	х			
Milk processing	-	-	-	-			
Brewing waters	-	0	-	х			
Lemonades, wines, soda water	-	0	-	х			
CIP and SIP processes	-	-	-	0			
Fermenters	-	-	-	х			
Wastewater treatment							
Sewer and inlet water	-	-	x	-			
Aeration tank/basin	0	-	х	-			
Clarifier/settling basin	0	-	x	-			
Outlet	0	-	x	-			
Sludge	-	-	0	-			
Sludge from minerals and mining processes	-	-	0	-			
Industrial wastewater	0	-	x	-			
Approvals							
ATEX, IECEx, FM, CSA, QPS	-	_	х	-			

		OPTISE	ENS 2-electroc	le sensors (ana	alogue)	
	OPTISENS COND 1200 water/ wastewater	OPTISENS COND 1210 water/ wastewater	OPTISENS COND 3200 pure water	OPTISENS COND 3220 high temperature	OPTISENS COND 5200 chemical	OPTISENS COND 72x0 hygienic
Page	31	31	31	31	31	31
Clean/treated water						
Pure water (steam preparation, condensate, semiconductor industries)	х	-	х	х	-	0
Pharmaceutical water	-	-	0	-	-	х
Partially demineralised water	х	0	х	0	-	0
Potable water	х	х	0	0	0	х
Surface water						
Natural waters	х	х	0	-	0	-
Sea water	-	-	-	-	х	-
Waters in process industries						
Cleaning and rinsing	х	х	0	-	Х	-
Brine, salt solutions	0	0	-	-	х	-
Acids and bases	0	0	-	-	Х	-
Neutralisation processes	0	0	-	-	Х	-
Water loaded with reagents or products	0	0	-	-	х	-
Hygienical process waters						
Food and beverage	-	-	-	-	-	х
Milk processing	-	-	-	-	-	-
Brewing waters	0	-	0	-	-	х
Lemonades, wines, soda water	-	-	-	-	-	х
CIP and SIP processes	-	-	-	-	-	0
Fermenters	-	-	-	-	-	х
Wastewater treatment						
Sewer and inlet water	-	0	-	-	х	-
Aeration tank/basin	-	0	-	-	х	-
Clarifier/settling basin	-	х	-	-	х	-
Outlet	х	х	-	-	х	-
Sludge	-	-	-	-	0	-
Sludge from minerals and mining processes	-	-	-	-	0	-
Industrial wastewater	0	0	-	-	х	-
Approvals						
ATEX, IECEx, FM, CSA, QPS	-	-	-	-	-	-

x = best selection, o = suitable, - = not suitable

Product selection list: Inductive conductivity

	OPTISENS ind (anal	uctive sensors ogue)	OPTISYS inductive systems		
	OPTISENS IND 1000 water/ wastewater	OPTISENS IND 7000 hygienic	OPTISYS IND 7100 hygienic	OPTISYS IND 8100 hygienic	
Page	36	36	37	37	
Clean/treated water	-				
Pure water (steam preparation, condensate, semiconductor industries)	-	-	-	-	
Pharmaceutical water	-	-	-	-	
Partially demineralised water	-	-	-	0	
Potable water	-	0	0	х	
Surface water					
Natural waters	x	o	0	о	
Sea water	x	0	0	0	
Waters in process industries					
Cleaning and rinsing	x	0	х	0	
Brine, salt solutions	х	0	х	0	
Acids and bases	x	0	х	0	
Neutralisation processes	х	0	х	0	
water loaded with reagents or products	х	0	Х	0	
Hygienical process waters					
Food and beverage	-	х	0	x	
Milk processing	-	х	0	x	
Brewing waters	-	x	0	x	
Lemonades, wines, soda water	-	x	0	x	
CIP and SIP processes	-	х	0	x	
Fermenters	-	х	0	x	
Wastewater treatment					
Sewer and inlet water	x	-		-	
Aeration tank/basin	х	-	-	-	
Clarifier/settling basin	х	-	-	-	
Outlet	х	-	-	-	
Sludge	x	-	-	-	
Sludge from minerals and mining processes	х	-	-	-	
Industrial wastewater	x	-	-	-	
Approvals					
3A, EHEDG	-	-	-	x	
FDA	-	х	_	x	

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Product selection list: Total suspended solids

	Total suspended solids					
	OPTISENS TSS 2000 water/ wastewater	OPTISENS TSS 3000 water/ wastewater	OPTISENS TSS 7000 hygienic	OPTISYS TSS x 050 hygienic		
Page	42	42	42	43		
Installation/size	Immersion Ø40 mm	Immersion 1 1/4" NPT	Triclamp/ Varivent®	G1/2" Hygenic PG 13.5		
Clean/treated water						
Pure water (steam preparation, condensate, semiconductor industries)	-	-	-	-		
Pharmaceutical water	-	-	-	-		
Partially demineralised water	-	-	-	-		
Potable water	-	-	x	x		
Surface water						
Natural waters	0	x	-	-		
Sea water	-	x	-	-		
Waters in process industries						
Cleaning and rinsing	х	x	-	-		
Brine, salt solutions	-	x	-	-		
Acids and bases	0	0	-	-		
Neutralisation processes	-	-	-	-		
Water loaded with reagents or products	0	0	-	-		
Hygienical process waters						
Food and beverage	-	-	x	x		
Milk processing	-	-	x	x		
Brewing waters	-	-	x	x		
Lemonades, wines, soda water	-	-	х	х		
CIP and SIP processes	-	-	x	x		
Fermenters	-	-	x	x		
Heat exchanger	-	-	x	x		
Separators	-	-	x	x		
Wastewater treatment						
Sewer and inlet water	х	х	-	-		
Aeration tank/basin	х	х	-	-		
Clarifier/settling basin	х	х	-	-		
Outlet	x	х	-	-		
Sludge	0	0	-	-		
Sludge from minerals and mining processes	x	x	-	-		
Industrial wastewater	x	x	-	-		
Approvals						
3A	-	-	x	-		

Product selection list: Dissolved oxygen and turbidity

		Dissolved oxygen	Turbidity		
	OPTISENS ADO 2000 amperometric	OPTISENS ODO 2000 optical	OPTISENS ODO 2000 optical	OPTISENS TUR 2000	OPTISENS TUR 2000
Page	48	48	48	49	49
Installation/size	Immersion	Immersion	Insertion	Immersion	Insertion
Close/treated water	Ø40 mm	Ø60 mm	Ø40 mm	060 mm	Ø40 mm
Pure water (steam preparation, con- densate, semiconductor industries)	_	_	_	_	0
Pharmaceutical water	_	_	_	_	_
Partially demineralised water	_	_	_	_	0
Potable water	x	x	x	_	0
Surface water					
Natural waters	x	x	x	x	x
Sea water	_	0	0	х	x
Waters in process industries					
Cleaning and rinsing	-	-	-	x	х
Brine, salt solutions	-	-	-	x	х
Acids and bases	-	-	-	0	0
Neutralisation processes	-	-	-	-	-
Water loaded with reagents or products	-	-	-	0	0
Hygienical process waters					
Food and beverage	-	-	-	-	-
Milk processing	-	-	-	-	_
Brewing waters	-	-	-	-	_
Lemonades, wines, soda water	-	-	-	-	-
CIP and SIP processes	-	-	-	-	-
Fermenters	-	-	-	-	-
Heat exchanger	-	-	-	-	-
Separators	-	-	-	_	-
Wastewater treatment					
Sewer and inlet water	х	х	х	х	x
Aeration tank/basin	х	х	х	х	х
Clarifier/settling basin	х	х	x	x	х
Outlet	x	x	x	x	x
Sludge	-	-	-	-	-
Sludge from minerals and mining processes	-	-	-	-	-
Industrial wastewater	х	х	х	х	x

Product selection list: Turbidity, disinfection and sludge level

This table will help you in selecting the sensor or system for your application

	Turbidity	Free chlorine/chlorine dioxide/ozone	Sludge level
	OPTISYS TUR 1060	OPTISENS/ OPTISYS CL1100	OPTISYS SLM 2100
Page	49	58	59
Installation/size	Bypass	Flow cell; PG 13.5/Ø12 mm	Open basin
Clean/treated water			
Pure water (steam preparation, con- densate, semiconductor industries)	x	-	-
Pharmaceutical water	0	-	-
Partially demineralised water	х	0	-
Potable water	х	х	х
Surface water			
Natural waters	0	-	0
Sea water	-	0	-
Waters in process industries			
Cleaning and rinsing	0	-	-
Brine, salt solutions	-	0	-
Acids and bases	-	-	-
Neutralisation processes	-	-	0
Water loaded with reagents or products	_	_	0
Hygienical process waters			
Food and beverage	-	-	-
Milk processing	-	_	_
Brewing waters	0	_	-
Lemonades, wines, soda water	0	_	-
CIP and SIP processes	_	_	_
Fermenters	-	_	_
Heat exchanger	-	_	_
Separators	-	_	_
Wastewater treatment			
Sewer and inlet water	-	-	0
Aeration tank/basin	-	-	-
Clarifier/settling basin	-	-	Х
Outlet	-	0	-
Sludge	-	-	Х
Sludge from minerals and mining processes	_	_	x
Industrial wastewater	_	_	_

x = best selection, o = suitable, - = not suitable

SMARTPAT – The first family of analytical sensors that no longer require transmitters



Introduced in 2013, SMARTPAT digital sensors revolutionised the handling of analytical measurements: KROHNE miniaturised the entire transmitter technology and fitted it into the sensor head. Thanks to its unique circuit technology and special encapsulation, the SMARTPAT series offer process reliability at a level previously unknown.

SMARTPAT sensors function as 2-wire loop powered systems. They can be used both in point-to-point operation and for multi-drop installations. Up to 32 sensors can be connected in a loop of more than 1000 m in length.

Each SMARTPAT sensor is specifically designed for its field of application: approvals and certifications range from installation in explosive (zone 0) to hygienic areas. Thanks to its standardised connector design, SMARTPAT sensors are compatible with most of the existing mounting assemblies. A large portfolio of accessories ensures that SMARTPAT will fit into your application:

- OPTIBRIDGE, USB interface cable for offline calibration and configuration with PACTware[™] FDT/DTMs for each parameter
- SD 200 W/R, loop powered indicators for wall or rack mounting
- SJB 200 W/-Ex, junction boxes with connection for HART[®] handheld
- SMARTMAC 200 W, operating unit with calibration and configuration function
- SHD 200, control unit for 4...20 mA/HART[®] field devices







Direct connection to the process control system

KROHNE is the only supplier that uses a real open standard – and a direct connection from sensor to the process control system via the standardised fieldbus. The SMARTPAT sensors store all data and transfer it bidirectionally and digitally with the 4...20 mA current signal via the HART® protocol to process control and asset management systems, handhelds, PCs and other peripheral devices. Sensor configuration is possible using a HART® handheld device and freely available HART® DD or also via freely available PACTware[™] FDT/DTM on all conventional asset management and process control systems.

Offline calibration

SMARTPAT sensors can be connected directly to a PC via OPTIBRIDGE (USB interface cable) for offline calibration and configuration with PACTware™ FDT/DTM. Before the offline calibration the sensors can be cleaned and regenerated. Depending on the application purpose and site, their service life is up to four times longer under these circumstances.

The sensor handling in the laboratory shows a huge advantage instead of sensor handling at the application site under continually changing conditions. Due to the controlled, clean conditions in the laboratory, a much more exact calibration can be performed, too. This enables more precise measuring results and higher product quality.

Additionally SMARTPAT sensors can still be calibrated and configurated online in accordance with HART[®] handheld and free of charge HART[®] DD software.

Saves a lot of money, time and effort

The elimination of the external transmitter reduces the price and maintenance costs of the complete measuring point considerably in comparison with any other competing measuring system. Additionally the offline calibration reduces time and effort significantly. At the same time, it increases productivity and efficiency of the measuring point.



Universal control unit for 4...20 mA/HART® field devices

The loop powered SHD 200 offers a huge variety of functions for data visualisation and process control tasks. All values for the 4...20 mA and HART[®] signals can be displayed in different user-configurable measuring pages. A trend graph thereby maps the measuring values of the selected parameter and summarizes all characteristic data in a separate page.

A second current output is available for all HART® variables, e.g. for the process temperature as tertiary variable. 5 bright LEDs with different colours can be used for status signalisation according to NE107 directly at the device.

The SHD 200 can be used as local display and control unit for basic functions of 4...20 mA/HART[®] field devices. Full access to all sensor functions including calibration is possible by connecting a HART[®] handheld device to the internal HART[®] adapter. As option, an external access point is available, allowing for full sensor menu access without opening the enclosure.

The device is equipped with two configurable relays that can be used as status output, system alarm or limit switch. Simple dosing tasks, e.g. in neutralisation processes, can be served. Pure water production processes can be supervised by using the USP <645> feature.



For technical details see page 66



Analytical modules for turbidity / dissolved oxygen or inductive conductivity / pH, ORP and conductive conductivity measurement

Simplification of the water quality measurement

Monitoring different parameters in water treatment processes can lead to a setup where different measuring points are scattered across the plant. Existing pipelines have to be equipped with assemblies and each transmitter has to be mounted individually on the wall. But not only the installation effort results in high costs. Maintenance can also be time consuming when sensors and assemblies are not easy to access.

Reduce the complexity, increase the flexibility

The water analysis panel is a multi-parameter measuring system for water applications. It consists of single modules that can be combined for measuring dissolved oxygen, turbidity, conductivity, pH and ORP. Depending on the requirements, the measuring system can thus be operated as a complete solution or with selected modules allowing configuration of different sensor types. This provides a high degree of flexibility in accordance with the application requirements.

The pre-assembled and pre-wired analysis panel enables easy installation and fast commissioning. In this way, complexity and installation effort are significantly reduced as compared to spatially separated measuring points.

Highlights:

- Continuous monitoring of water quality
- All measuring parameters installed at one location: Only one sample line required
- Easy process integration and commissioning
- Better sensor access for lower maintenance effort
- Application-specific selection of analytical parameters
- Free configuration of sensor type for high flexibility
- Space saving modular design
- Panel material: PVC white or stainless steel (1.4301)

See page 58 and 64 to get information about the measuring system OPTISYS CL 1100 for the parameters free chlorine, chlorine dioxide and ozone.

From flow to analysis – Applying our proven operating and service concept

MAC 100 - One transmitter for several parameters

The MAC 100 is a signal transmitter for liquid analysis that adheres to the same General Device Concept with the same graphic display as our flow and level converters. This means rapid commissioning, reduced training times and standardisation of your measuring instruments and therefore saving money.

The MAC 100 is suitable for operating up to two analogue analytical sensors for many different parameters: pH/ ORP, conductivity (conductive, inductive), oxygen (optical, amperometric), turbidity, total suspended solids, free chlorine, chlorine dioxide and ozone. Due to its robust aluminium housing the MAC 100 is even suited for the harshest ambient conditions. Its optional stainless steel version is the perfect fit for all applications with hygienic requirements.



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MAC 300 – Up to 3 parameters

The MAC 300 signal transmitter was designed with strong focus on user-friendliness resulting in easy calibration and configuration of all sensors. Suitable for the parameters TSS, pH/ORP and conductivity, the MAC 300 fulfils even demanding applications. Available as wall and panel housing versions it allows a user selected combination of three sensors and up to 6 analogue and relay outputs each.

The standard SD card interface provides high flexibility in terms of data handling. Backup and restoration of instrument settings, copying of settings between instruments and upgrading of the instrument's software simplify handling.

As option, a live-trending function allows the monitoring and analysis of all measurement values and also logging of sensor readings. Thanks to these functions, a perfect control, alerting and response of the system is possible.

Parameter/sensor	MAC 100	MAC 300
OPTISENS pH/ORP	х	х
OPTISENS COND	х	х
OPTISENS IND	х	-
OPTISENS CL (ClO ₂ , O ₃)	х	-
OPTISENS TSS 2000	х	-
OPTISENS TSS 3000/7000	_	х
OPTISENS TUR	х	-
OPTISENS ODO	x	-
OPTISENS ADO	х	-

x = suitable, - = not suitable



SMARTPAT pH/ORP digital sensors



SMARTPAT PH 8320* For water and wastewater applications



SMARTPAT PH 1590 For potable, process or treated water applications



SMARTPAT ORP 8150* For chemicals and industrial wastewater applications

Accessories



SMARTMAC 200 W* Operating unit for on-site calibration and configuration of SMARTPAT sensors



SMARTPAT PH 8530 For pure water and low conductivity media (>2 µS/cm)



SMARTPAT PH 2390 For process, municipal and industrial wastewater applications



SMARTPAT ORP 8510 For water and wastewater applications



SMARTPAT PH 8150* For chemicals and industrial wastewater applications



SMARTPAT PH 8570* For food, beverage and pharmaceutical applications



SMARTPAT ORP 1590 For water and wastewater applications

*also available with Ex approval



SD 200* Multiparameter indicator for analytical and other parameters



SJB 200 W* Junction box for connecting SMARTPAT sensors to control systems and HART[®] devices



OPTIBRIDGE* USB interface cable for offline calibration and configuration of SMARTPAT sensors

Assemblies for SMARTPAT and OPTISENS sensors

SHD 200*

field devices

Universal control unit

for 4...20 mA/HART®

Flow-through assemblies



SENSOFIT FLOW 1000 Y For chemical and water treatment applications, G1 (female)



SENSOFIT INS 1000/1310/731x

For all-purpose applications in

various industries

Retractable assemblies, manual and pneumatic



SENSOFIT RET 5000* For harsh chemical and water treatment applications, length up to 700 mm/27.6"



SENSOFIT RET 5810 For harsh chemical and water treatment applications



SENSOFIT RAM 5830 For hygienic applications in the food, beverage and pharmaceutical industry

OPTISENS pH/ORP analogue sensors



OPTISENS PH 8300 For wastewater, surface and process water applications



OPTISENS PH 8100 For chemicals and pure water applications (>2 µs/cm)



OPTISENS ORP 8500 For water and wastewater applications

Accessories



MAC 100 Liquid analytical transmitter for measurements with sensors of the OPTISENS portfolio



OPTISENS PH 8500 For potable water applications



OPTISENS PH 9100 For lower conductivity water applications (>20 µS/cm)



OPTISENS PH 8590 For municipal and industrial wastewater applications



OPTISENS PH 9500 For lower conductivity water applications (>50 µS/cm)



For wastewater applications

OPTISENS PH 8390

OPTISENS ORP 8590 For water and wastewater applications



MAC 300 Liquid analytical transmitter for measurements with OPTISENS TSS, pH/ORP and COND sensors

Immersion assemblies



SENSOFIT IMM 1000 For general water and wastewater treatment applications – up to 3 pH/ORP sensors applicable



SENSOFIT IMM 2000 For general water and wastewater treatment applications, telescopic rod holder mounted to handrail



SENSOFIT IMM 2920 For chemical and wastewater treatment applications, automatic cleaning option

Potentiometric pH and ORP sensors

Highlights:

- Digital and analogue sensors available
- 2-wire loop powered sensors with integrated transmitter technology
- True open standard in fieldbus systems HART®
- Ex approvals (zone 0) e.g. IECEx
- Increased safety due to direct connection to the process control system
- Extended lifetime of sensors due to the offline calibration and regeneration
- Offline statistic over complete life cycle
- Ingress protection IP68
- Different diaphragm materials for all applications
- Integrated temperature sensor
- Fits into most mounting assemblies
- No special cable needed



pH/ORP measurement

The measuring principle

Arnold Orville Beckmann built the first pH-meters in 1935 to measure the pH-value of citric acid in lemons. The pH value was determined by a potentiometric measurement using a pH sensor with a glass membrane. This glass membrane separates the measuring solution from the inner electrolyte. On both sides of a glass membrane a surface potential is built up. The inner electrolyte is an aqueous solution with well-known pH-value. Thus, the H+-activity and the relating electrical potential of the inner side is defined. The electrical potential on the outside of the glass membrane is proportional to the H+-activity of the measuring solution. So, in a pH electrode the occurring potential difference between the inner electrolyte and the measuring solution is measured.

A complete pH measuring loop consists of a pH half-cell as described and a reference electrode. The potential of the reference electrode is independent of the pH value and provides a stable electrical potential, the so-called reference potential. Via a diaphragm a continuous diffusion of ions from the reference electrolyte into the measuring solution is guaranteed. Thus, the reference electrode is in electrical contact with the measuring solution. Through this the electric circuit is closed and the voltage generated by the measuring loop can be measured at the signal converter. The pH half-cell and reference electrode are usually integrated in a combination electrode, the single-rod measuring cell.

The Oxidation-Reduction Potential Potential (ORP)

During an oxidation-reduction reaction, electrons are transferred between two chemical substances in solution. One substance is oxidized (loss of electrons), the other one is reduced (acquire/gaining of electrons). Usually, several different substances (ions, molecules) are dissolved in a solution. Therefore, different oxidationreduction reactions may take place. The sum of their potentials is the oxidation-reduction potential (ORP), which can be measured with an inert metal electrode (platinum, gold). The ORP gives a measure about the oxidizing or reducing power of the solution. The ORP sensor is built up similar to a pH combination electrode, whereas the measuring electrode is made of metal instead of glass.



SMARTPAT PH 8150 with SENSOFIT RET 5810 in a chemical plant

Made to fit

SMARTPAT and OPTISENS pH and ORP sensors are available in a wide choice of body styles with different membrane glasses and diaphragm materials. Additionally there are versions with Ex approvals (zone 0) available.

Our pH and ORP sensors are suitable for a large range of applications such as pure water control, process monitoring in hygienic areas over to harsh environments like industrial wastewater treatment to process control and monitoring in chemical plants. As the first sensor line in the market, the SMARTPAT PH/ORP sensors have an integrated transmitter with HART® 7 communication and current output, which makes them easy to integrate in any process loop.

So, our SMARTPAT/OPTISENS sensors are made to fit just about every application in liquid analytics.

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Typical applications

Chemical

- All types of neutralisation processes
- Reverse osmosis
- Plastics production
- Fertilizer production

Pharmaceutical/food/beverage

- Process control of pharmaceutical processes
- Process control in the production of cheese, milk, beer, fruit juices, yogurt

Power plants/semiconductor manufacturing

- Control of reverse osmosis
- Cooling water control
- Boiler feed water control

Wastewater

- Monitoring of surface water and wastewater
- Control of biology
- Neutralisation in industrial/ municipal wastewater
- Process control
- Dosage of flocculation agents
- Oily and greasy media

Water

• Process control and monitoring of limit values in potable water



2-wire digital pH/ORP sensors

	For water and wastewater applications	For pure water and low conductivity media (>2 µS/cm)	For chemicals and industrial wastewater applications	For food, beverage and pharmaceutical applications	
	SMARTPAT PH 8320*	SMARTPAT PH 8530	SMARTPAT PH 8150*	SMARTPAT PH 8570*	
	Contraction of the second seco			No. of the second se	
Parameter	рН	рН	рН	рН	
Diameter and insertion length	Ø12 mm/Ø0.5"; length: 120, 225 mm/ 4.7, 8.9"	Ø12 mm/Ø0.5"; length: 120, 225 mm/ 4.7, 8.9"	Ø12 mm/Ø0.5"; length: 120, 225 mm/ 4.7, 8.9"	Ø12 mm/Ø0.5"; length: 120, 225 mm/ 4.7, 8.9"	
Process connection	PG 13.5	PG 13.5	PG 13.5	PG 13.5	
Measuring range	014 pH	014 pH	014 pH	014 pH	
Measuring accuracy	0.5%	0.5%	0.5%	0.5%	
Diaphragm	PTFE	Ceramic	Open	Ceramic	
Reference	Ag/AgCl/TepoxGel	KCl gel	Duralid gel	RheoLid gel	
Glass type/ measuring electrode	AH glass	A glass	H glass	S glass	
Body material	Glass	Glass	Glass	Glass	
Temperature range	0+70°C/+32+158°F	0+80°C/+32+176°F	0+130°C/+32+266°F	0+140°C/+32+284°F (CIP, SIP, autoclavable)	
Pressure range	Max. 10 bar/145 psi	Max. 12 bar/174 psi	Max. 12 bar/174 psi Max. 12 bar/174 psi Max. 12 b		
Min. conductivity	>150 µS/cm	>2 µS/cm	>150 µS/cm	>100 µS/cm	
Communication	1 x 420 mA (passive), HART® 7	1 x 420 mA (passive), HART® 7	1 x 420 mA (passive), HART® 7	1 x 420 mA (passive), HART® 7	
Power supply	1530 V (loop powered)	1530 V (loop powered)	1530 V 1530 V (loop powered) (loop powered)		
Temperature sensor	Pt1000	Pt1000	Pt1000	Pt1000	
Connector	VP (VarioPin)	VP (VarioPin)	VP (VarioPin) VP (VarioPin)		
Approvals	IECEx, ATEX, NEPSI, FM (zone 0)	-	IECEx, ATEX, NEPSI, FM (zone 0)	IECEx, ATEX, NEPSI, FM (zone 0)	
Certificates	Calibration certificate; CE	Calibration certificate; CE	Calibration certificate; CE	Calibration certificate, FDA; CE	
Accessories	- OPTIBRIDGE USB interface cable - HART® DD- SHD 200 control unit - SMARTMAC 200 W operating unit - VP2 cables in various lengths - V3B 200 W junction box - SD 200 loop powered display- SHD 200 control unit - SMARTMAC 200 W operating unit - VP2 cables in various lengths - Various calibration solutions				

	For potable, process or treated water applications	For process, municipal and industrial wastewater applications	For chemicals and industrial wastewater applications	For water and wastewater applications	For water and wastewater applications	
	SMARTPAT PH 1590	SMARTPAT PH 2390	SMARTPAT ORP 8150*	SMARTPAT ORP 8510	SMARTPAT ORP 1590	
	States - Ales	SC ING	S Star		EN COLORIS	
Parameter	рН	рН	ORP	ORP	ORP	
Diameter and insertion length	Ø20 mm/Ø0.7"; length: 23 mm/0.9"	Ø20 mm/Ø0.7"; length: 23 mm/0.9"	Ø12 mm/Ø0.5"; length: 120, 225 mm/ 4.7, 8.9"	Ø12 mm/Ø0.5"; length: 120 mm/4.7"	Ø20 mm/Ø0.7"; length: 23 mm/0.9"	
Process connection	3/4" NPT (male)	3/4" NPT (male)	PG 13.5	PG 13.5	3/4" NPT (male)	
Measuring range	014 pH	014 pH	-15001500 mV	–15001500 mV	–15001500 mV	
Measuring accuracy	0.5%	0.5%	0.5%	0.5%	0.5%	
Diaphragm	Ceramic	PTFE	Open	Ceramic	Ceramic	
Reference	KCl gel	KCl gel	Duralid gel	Ag/AgCl/TepoxGel	KCl gel	
Glass type/ measuring electrode	Multi purpose glass	Multi purpose glass	Platinum	Platinum	Platinum	
Body material	CPVC	Ryton®	Glass	Glass	CPVC	
Temperature range	-5+80°C/+32+176°F	0+80°C/+32+176°F	0+130°C/+32+266°F	0+70°C/+32+158°F	0+80°C/+32+176°F	
Pressure range	Max. 6.9 bar/100 psi	Max. 6.9 bar/100 psi	Max. 12 bar/174 psi	Max. 2 bar/30 psi	Max. 6.9 bar/100 psi	
Min. conductivity	>150 µS/cm	>150 µS/cm	>150 µS/cm	>150 µS/cm	>150 µS/cm	
Communication	1 x 420 mA (passive), HART® 7	1 x 420 mA (passive), HART® 7	1 x 420 mA (passive), HART® 7	1 x 420 mA (passive), HART® 7	1 x 420 mA (passive), HART® 7	
Power supply	1530 V (loop powered)	1530 V (loop powered)	1530 V (loop powered)	1530 V (loop powered)	1530 V (loop powered)	
Temperature sensor	Pt1000	Pt1000	Pt1000	Pt1000	Pt1000	
Connector	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)	
Approvals	-	-	IECEx, ATEX, NEPSI, FM (zone 0)	-	-	
Certificates	Calibration certificate; CE	Calibration certificate; CE	Calibration certificate; CE	Calibration certificate; CE	Calibration certificate; CE	
Accessories	- OPTIBRIDGE USB interface cable - SHD 200 control unit - HART® DD - SMARTMAC 200 W operating unit - PACTware™ FDT/DTM - VP2 cables in various lengths - SJB 200 W junction box - Various calibration solutions - SD 200 loop powered display - Various calibration solutions					

Analogue pH/ORP sensors

	For wastowator, surface	For potable water	For lower conductivity	For chomicals and pure	
	and process water applications	applications	water applications (>20 µS/cm, >50 µS/cm)	water applications (>2 µs/cm)	
	OPTISENS PH 8300	OPTISENS PH 8500	OPTISENS PH 9100, OPTISENS PH 9500	OPTISENS PH 8100	
	Contraction of the second seco				
Parameter	рН	рН	рН	рН	
Diameter and insertion length	Ø12 mm/Ø0.5"; length: 120 mm/4.7"	Ø12 mm/Ø0.5"; length: 120 mm/4.7"	Ø12 mm/Ø0.5"; length: 160 mm/6.3" refillable liquid KCL filling	Ø12 mm/Ø0.5"; length: 120 mm/4.7"	
Process connection	PG 13.5	PG 13.5	PG 13.5	PG 13.5	
Measuring range	014 pH	014 pH	014 pH	014 pH	
Temperature range	-5+70°C/+23+158°F	-5+70°C/+23+158°F	-5+100°C/+23+212°F	0+130°C/+32+266°F	
Pressure range	Max. 10 bar/145 psi	Max. 2 bar/30 psi	Pressureless	Max. 10 bar/145 psi	
Min. conductivity	>150 µS/cm	>150 µS/cm	>20/50 µS/cm	>2 µS/cm	
Installation conditions	Pipe installations, Immersion installations	Pipe installations, Immersion installations	Various (pressureless)	Pipe installations, Immersion installations	
Temperature sensor	Pt100 (optional)	Pt100 (optional)	-	Pt100 (optional)	
Materials	AH-glass, EPDM gasket	AH-glass, EPDM gasket	AH-glass, EPDM gasket	H-glass, EPDM gasket	
Diaphragm	PTFE	Ceramic	OPTISENS PH 9100: open; OPTISENS PH 9500: ceramic	Open	
Connector	S8 DIN Koax, Variopin (VP)	S8 DIN Koax, Variopin (VP)	S7 DIN Koax	VarioPin (VP)	
Cables	Cables in various lengths available				

	For wastewater applications	For municipal and industrial wastewater applications	For water and wastewater applications	For water and wastewater applications		
	OPTISENS PH 8390	OPTISENS PH 8590	OPTISENS ORP 8500	OPTISENS ORP 8590		
Parameter	рН	рН	ORP	ORP		
Diameter and insertion length	Ø20 mm/Ø0.7"; length: 23, 44 mm/0.9,1.7"	Ø20 mm/Ø0.7"; length: 23 mm/0.9"	Ø12 mm/Ø0.5"; length: 120 mm/4.7"	Ø20 mm/Ø0.7"; length: 23 mm/0.9"		
Process connection	3/4" NPT (male)	3/4" NPT (male)	PG 13.5	3/4" NPT (male)		
Measuring range	014 pH	014 pH	-1500+1500 mV	-2000+2000 mV		
Temperature range	-5+80°C/+23+176°F	-5+80°C/+23+176°F	-5+70°C/+23+158°F	-5+80°C/+23+176°F		
Pressure range	Max. 6.9 bar/100 psi	Max. 6.9 bar/100 psi	Max. 2 bar/30 psi	Max. 6.9 bar/100 psi		
Min. conductivity	>150 µS/cm	>150 µS/cm	>150 µS/cm	>150 µS/cm		
Installation conditions	Pipe installations, Immersion installations	Pipe installations, Immersion installations	Pipe installations, Immersion installations	Pipe installations, Immersion installations		
Temperature sensor	Pt100	Pt100	-	Pt100		
Materials	CPVC, glass	CPVC, glass	Glass, platinum electrodes, EPDM gasket	CPVC, platinum electrode		
Diaphragm	PTFE Double junction	Ceramic Double junction	Ceramic	Ceramic Double junction		
Connector	attached cable	attached cable	S8 DIN Koax	attached cable		
Cables	Cables in various lengths available					

SMARTPAT COND digital sensors



SMARTPAT COND 1200 For water and wastewater applications



SMARTPAT COND 3200 For condensate, process, boiler feed or (ultra)pure water



SMARTPAT COND 5200* For chemicals and industrial wastewater applications



SMARTPAT COND 7200 For food, beverage and pharmaceutical applications

*also available with Ex approval

Accessories



SMARTMAC 200 W* Operating unit for on-site calibration and configuration of SMARTPAT sensors



SHD 200* Universal control unit for 4...20 mA/HART® field devices



SD 200* Multiparameter indicator for analytical and other parameters



SJB 200 W* Junction box for connecting SMARTPAT sensors to control systems and HART[®] devices



OPTIBRIDGE* USB interface cable for offline calibration and configuration of SMARTPAT sensors

Assemblies

Flow-through assemblies



SENSOFIT FLOW 1000 Y For chemical and water treatment applications, G1 (female)

Immersion assemblies



SENSOFIT IMM 2000 For general water and wastewater treatment applications, telescopic rod holder mounted to handrail

OPTISENS COND analogue sensors



OPTISENS COND 1200/1210 For water, wastewater, process water or pure water



OPTISENS COND 3200/3220 For condensate, process, boiler feed or (ultra)pure water



OPTISENS COND 5200 For industrial water, wastewater and chemical applications



OPTISENS COND 7200/7230 For food, beverage and pharmaceutical applications

Accessories



MAC 100 Liquid analytical transmitter for measurements with sensors of the OPTISENS portfolio



MAC 300 Liquid analytical transmitter for measurements with OPTISENS TSS, pH/ORP and COND sensors

Assemblies

Flow-through assemblies



SENSOFIT FLOW 1000 Y For chemical and water treatment applications, G1 (female)



Immersion assemblies

SENSOFIT IMM 1000 For general water and wastewater treatment applications

Conductive conductivity sensors

Conductive conductivity measurement

The measuring principle

The principle of conductivity measurement is defined as the capacity of a solution to conduct an electrical current between two electrodes. In a solution, the current flows by ion transport. The higher the ion concentration, the more current can flow. Using Ohm's law: Resistance = Voltage/Current, the resistance of a liquid can be determined by measuring the current while keeping voltage constant. Specific conductivity is defined by 1/resistance.The unit of measurement is Siemens/m and is normally expressed in μ S/cm.

An important criterion for the measuring range of conductivity cells is the geometry of the electrodes. There are two rules which are characteristic for conductivity measurement:

- 1. The larger the distance between the two electrodes, the higher the resistance.
- 2. The larger the electrode surface, the lower the resistance.

The surface area (A) and the distance (L) must be correctly matched to the desired measuring range. This is called the "cell constant" defined as c=L/A.



Highlights:

- Digital and analogue sensors available
- 2-wire loop powered sensors with integrated transmitter technology
- True open standard in fieldbus systems HART®
- Ex approvals (zone 0) e.g. IECEx
- Increased safety due to direct connection to the process control system
- Integrated temperature sensor
- Different cell constants for a wide range of applications
- Stainless steel, titanium or graphite electrode materials
- Wide range of process connections for seamless integration
- Hygienic versions available



Easy to integrate

The measurement of conductive conductivity is used in many applications and is after pH the second most important parameter in analytic measurements.

This is particulary true of SMARTPAT COND and OPTISENS COND sensors. The large selection of cell constants and different electrode materials means they can be successfully applied to anything like aggressive media or from ultrapure water to potable water.

Additionally due to the innovative SMARTPAT technology the SMARTPAT COND sensors can be directly connected to any common process control system using industry standard communication like 4...20 mA/HART[®]. They are hence easy to integrate into any plant infastructure.



OPTISENS COND 1200

SMARTPATSMARTPATCOND 3200COND 5200

SMARTPAT COND 7200

Typical applications

Power

- Quality measurement in condensate, cooling water, boiler feed water
- Reverse osmosis
- Monitoring of ion exchanger

Water

 Process monitoring in water treatment plants (industrial and potable water)

Semiconductor

 Monitoring of ultrapure water in semiconductor production

Food and beverage, pharmaceutical

- Pure water and ultrapure water monitoring
- Separation processes (milk/water)
- Distillation
- Electro deionisation
- Monitoring of ion exchanger/ reverse osmosis

Chemical

- Separation processes (caustic/water)
- Process monitoring water treatment
- Process monitoring wastewater treatment

2-wire digital conductive conductivity sensors

	For water and wastewater applications	For condensate, process, boiler feed or (ultra)pure water	For chemicals and industrial wastewater applications	For food, beverage and pharmaceutical applications	
	SMARTPAT COND 1200	SMARTPAT COND 3200	SMARTPAT COND 5200*	SMARTPAT COND 7200	
		A Carlor	No.	- Contraction of the second se	
Parameter	Conductive conductivity	Conductive conductivity	Conductive conductivity	Conductive conductivity	
Туре	2-electrode measu- ring cell with integra- ted temp. sensor	2-electrode measu- ring cell with integra- ted temp. sensor	2-electrode measu- ring cell with integra- ted temp. sensor	2-electrode measu- ring cell with integra- ted temp. sensor	
Measuring range	c = 1 cm ⁻¹ : 100 µS/cm20 mS/cm at +25°C/+77°F	c = 0.01 cm ⁻¹ : 0.0510 μ S/cm c = 0.1 cm ⁻¹ : 11000 μ S/cm at +25°C/+77°F	c = 1 cm ⁻¹ : 10 μS/cm15 mS/cm at +25°C/+77°F	c = 0.01 cm ⁻¹ : 0.0510 μ S/cm c = 0.1 cm ⁻¹ : 11000 μ S/cm at +25°C/+77°F	
Measuring accuracy	<3% of the measured value	<3% of the measured value	<3% of the measured value	<3% of the measured value	
Temperature range	0+135°C/ +32+275°F	0+135°C/ +32+275°F	0+130°C/ +32+266°F	0+135°C/ +32+275°F	
Pressure range	Max. 16 bar/232 psi	Max. 16 bar/232 psi	Max. 16 bar/232 psi	Max. 16 bar/232 psi	
Installation	G3/4A male	G3/4A male, 3/4"NPT male	G3/4A male, 3/4"NPT male	Varivent DN40-125 Clamp DN25/32/40 Clamp DN50	
Insertion length	100 mm/3.94"	60 mm/2.36"	60 mm/2.36"	40 mm/1.57" 70 mm/2.76"	
Diameter	20 mm/0.79"	22 mm/0.87"	23.5 mm/0.93"	22.5 mm/0.88"	
Materials	Electrodes: Stainless steel (1.4571/316Ti); Process connection: PVDF; Isolator: PVDF	Electrodes: Stainless steel (1.4571/316Ti); Process connection: PVDF; Isolator: PVDF	Electrodes: Graphite; Process connection: PVDF	Electrodes/process connection: Stainless steel (1.4435/316L); Isolator: PEEK	
Communication	1 x 420 mA (passive); HART® 7	1 x 420 mA (passive); HART® 7	1 x 420 mA (passive); HART® 7	1 x 420 mA (passive); HART® 7	
Power supply	1530 V (loop powered)	1530 V (loop powered)	1530 V 1530 V (loop powered) (loop powered)		
Temperature sensor	Pt1000	Pt1000	Pt1000	Pt1000	
Connector	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)	
Approvals	-	-	IECEx, ATEX, QPS (zone 0)	-	
Certificates	Calibration certificate; CE	Calibration certificate; CE	Calibration certificate; CE	3.1, FDA, calibration certificate; CE	
Accessories	- OPTIBRIDGE USB interface cable - SHD 200 control unit - HART® DD - SMARTMAC 200 W operating unit - PACTware™ FDT/DTM - VP2 cables in various lengths - SJB 200 W junction box - Various calibration solutions - SD 200 loop powered display -				

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Analogue conductive conductivity sensors

	For water, wastewater, process water or pure water		For condensate, process, boiler feed or (ultra) pure water		For industrial water, waste- water and chemical applications	For food, beverage and pharmaceutical applications	
	OPTISENS COND 1200	OPTISENS COND 1210	OPTISENS COND 3200	OPTISENS COND 3220	OPTISENS COND 5200	OPTISENS COND 7200	OPTISENS COND 7230
						and the second s	X
Parameter	Conductive conductivity	Conductive conductivity	Conductive conductivity	Conductive conductivity	Conductive conductivity	Conductive conductivity	Conductive conductivity
Туре	2-electrode measuring cell with integrated temperature sensor	2-electrode measuring cell with integrated temperature sensor	2-electrode measuring cell with integrated temperature sensor	2-electrode measuring cell with integrated temperature sensor	2-electrode measuring cell with integrated temperature sensor	2-electrode measuring cell with integrated temperature sensor	2-electrode measuring cell with integrated temperature sensor
Measuring range	c = 0.05 cm ⁻¹ : 0.1200 μS/cm c = 0.2 cm ⁻¹ : 12000 μS/cm c = 1 cm ⁻¹ : 0.120 mS/cm	c = 0.2 cm ⁻¹ : 12000 µS/cm c = 1 cm ⁻¹ : 0.120 mS/cm	c = 0.01 cm ⁻¹ : 0.0510 µS/cm c = 0.1 cm ⁻¹ : 0.0011 mS/cm	c = 0.1 cm ⁻¹ : 0.0011 mS/cm	c = 1 cm ⁻¹ : 0.0115 mS/cm	c = 0.01 cm ⁻¹ : 0.0510 μS/cm c = 0.1 cm ⁻¹ : 0.0011 mS/cm	c = 0.01 cm ⁻¹ : 0.0510 μS/cm c = 0.1 cm ⁻¹ : 0.0011 mS/cm
Temperature range	0+135°C/ +32+275°F	0+90°C/ +32+194°F	0+135°C/ +32+275°F	0+200°C/ +32+392°F	0+130°C/ +32+266°F	0+135°C/ +32+275°F	0+135°C/ +32+275°F
Pressure range	16 bar at +25°C/ 232 psi at +77°F	16 bar at +25°C/ 232 psi at +77°F	16 bar at +25°C/ 232 psi at +77°F	40 bar at +25°C/ 580 psi at +77°F; 17 bar at +200°C/ 246 psi at+392°F	16 bar at +25°C/ 232 psi at +77°F	16 bar at +25°C/ 232 psi at +77°F 9 bar at +60°C/ 130.5 psi at +140°F	16 bar at +25°C/ 232 psi at +77°F 1 bar at +135°C/ 14 psi at +275°F
Installation	G 3/4 male	G 1/2 male (sensor rear end; immersion style)	G 3/4 male G 1/2 male G1 male 3/4"NPT male	3/4"NPT male	G 3/4 male G1 male 3/4"NPT male	Clamp DN 25/40 DIN 32676 (1.5")	Clamp DN 25/40 DIN 32676 (1.5")
Insertion length	100 mm/3.94"	100 mm/3.94"	60 mm/2.36"	45 mm/1.77"	60 mm/2.36"	60mm/2.36"	115mm/4.53"
Diameter	20 mm/0.79"	20 mm/0.79"	16 mm/0.63"; 22 mm/0.87"; 23.8 mm/0.94"	19 mm/0.75"	23.5 mm/0.93"	22 mm/0.87"	16 mm/0.63"
Materials	Electrodes: Stainless Steel 1.4571/316 Ti; Body: PVDF	Electrodes: Stainless Steel 1.4571/316 Ti; Body: PP	Electrodes: Stainless Steel 1.4571/316Ti or Titanium; Body: PVDF or Stainless Steel 1.4571/316Ti	Electrodes and body: Stainless Steel 1.4404/316L	Electrodes: Graphite; Electrode holder: PES(GF); Body: PVDF	Electrodes and body: Stainless Steel 1.4435/316L; Surface rough- ness Ra<0.8µm	Electrodes and body: Stainless Steel 1.4435/316L; Surface rough- ness Ra<0.8µm
Temperature sensor	Pt 100	Pt 100	Pt 100	Pt 100	Pt 100	Pt 100	Pt 100
Connector	4-pin right-angle plug (Hirschmann)	10 m cable	4-pin right-angle plug (Hirschmann)	4-pin right-angle plug (Hirschmann)	4-pin right-angle plug (Hirschmann)	4-pin right-angle plug (Hirschmann)	M 12 connector
Certificates	-	-	-	-	-	3.1 for material; 2.1 for cell constant (ASTM); Surface rough- ness Ra<0.8µm; FDA conformity	3.1 for material; 2.1 for cell constant (ASTM); Surface rough- ness Ra<0.8µm; FDA conformity

OPTISENS IND analogue sensors



OPTISENS IND 1000 (PP) For water, wastewater and general purpose applications; insertion



OPTISENS IND 7000 For food and beverage applications

Accessories



MAC 100 Liquid analytical transmitter for measurements with sensors of the OPTISENS portfolio

Flow-through assemblies



SENSOFIT FLOW 1000 T For chemical and water treatment applications. G1 1/2 sensor connection; socket weld process connection



OPTISENS IND 1000 (PVDF) For chemical and wastewater applications; insertion



OPTISENS IND 1000 (PP) For water, wastewater and general purpose applications; immersion assembly included
OPTISYS IND measuring systems



OPTISYS IND 7100 For food and beverage applications, process connection dairy screw (DIN 11851) DN50



OPTISYS IND 8100 For food and beverage applications, process connection G1 (hygienic, male) with hygienic adapters

Accessories



Configuration tool for OPTISYS IND 8100



Process connections G1B, hygienic adapters for OPTISYS IND 8100

Inductive conductivity sensors and systems

Highlights:

- Electrodes not in contact with the media
- Different materials for all applications e.g. PVDF, PP, PEEK
- Insensitive to contamination
- Integrated automatic temperature compensation with fast response time
- Excellent long-term stability in all liquids
- Perfect linearity at high conductivity values
- No polarisation effects at high conductivity values
- Different process connections including hygienic connections
- Immersion version for installation in open channels
- Hygienic design

Inductive conductivity measurement

The measuring principle

The well-known Faraday Law of magnetic induction is used here to determine conductivity in solutions at higher values, where direct contact measurement is not well suited.

When a magnetic field is generated by an electrical coil and a second electrical coil is placed next to it, a certain amount of electric energy will be transferred to it. With an inductive conductivity sensor, the process medium surrounds the whole sensing area. It also fills the inner hole of the coils, thus forming a liquid conductive loop. The amount of energy transferred from the primary to the secondary coil is then directly proportional to the electrical conductivity of the solution.





Conductivity monitoring for product control at soft drink manufacturer

Resistant to dirt

The OPTISENS IND sensors can safely be used for conductivity measurements in aggressive and corrosive media like industrial wastewater, sea water and acidic solutions.

The measuring electrodes of the OPTISENS IND sensors are completely sealed and have no direct contact with media. Tough chemical and dirt-resistant materials are used, such as PVDF, PP or PEEK.

Thanks to the OPTISENS IND rugged design and special materials, the sensors have a long life span and are practically maintenance free.

The OPTISENS IND 7000 series additionally provides hygienic connections and approvals for applications in food, beverages and pharmaceutical processes.

The OPTISYS IND 8100 was especially designed for immediate detection of media changes during CIP/SIP processes, e.g. in dairies or breweries. It is available as compact or remote system with a broad variety of 3-A/EHEDG approved process connections.

Typical applications

Water

- Regeneration of ion exchangers
- Control of sea water desalination processes

Wastewater

• Monitoring of limit values in industrial influent at the inlet of wastewater treatment plants

Food and beverage

- Product control (dairies, breweries, beverages)
- CIP/SIP processes
- Regeneration of ion exchangers (steam generation)



OPTISENS IND 7000



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Inductive conductivity sensors and systems

	For water, wastewater and chemical applications	For food and beverage applications
	OPTISENS IND 1000	OPTISENS IND 7000
Parameter	Inductive conductivity	Inductive conductivity
Туре	Inductive measuring cell with integrated temperature sensor	Inductive measuring cell with integrated temperature sensor
Enclosure rating	IP68	IP67
Measuring range	12000 mS/cm	0.52000 mS/cm
Temp range	PP: -10+60°C/+14+140°F PVDF: -10+100°C/+14+212°F	-10+125°C (briefly +140°C)/ +14+257°F (briefly +284°F)
Pressure range	Max. 10 bar/145 psi at +20°C/+68°F	Max. 10 bar/145 psi at +80°C/+176°F
Temp sensor	Pt1000 external or internal	Pt1000
Process connection	G 1 1/2 cap nut for T-piece installation; Immersion mounting assembly 1 m/3.3 ft or 2 m/6.6 ft	Varivent DN 40 –125 Dairy screw (DIN 11851) DN 50, DN 65 G 1 1/2A, G 2A
Materials	Insertion: PP or PVDF; Cap nut: PVC or SS Immersion: PP	PEEK
Installation	Pipe mounting or immersion into basins	Pipe mounting
Insertion length	approx. 80 mm/3.15"	Varivent: 36 mm/1.42" other versions: 76 mm/2.99"
Connector	10 m/32.8 ft cable	10 m/32.8 ft cable
Certificates	_	FDA, calibration certificate

	For food and beverage applications, process connection dairy screw (DIN 11851) DN50	For food and beverage applications, process connection G1 (hygienic, male) with hygienic adapters
	OPTISYS IND 7100	OPTISYS IND 8100
Parameter	Inductive conductivity	Inductive conductivity
Туре	Compact measuring system incl. converter	Measuring system, compact or remote; display with relays as option
Enclosure rating	IP67	IP67/IP69K
Measuring range	0.52000 mS/cm Concentration of caustic soda and nitric acid, or customer defined	0.051000 mS/cm Concentration of caustic soda and nitric acid, or customer defined
Temp range	-10+120°C/+14+248°F (briefly +140°C/+284°F)	-20+140°C/-4+285°F (+150°C/+302°F < 1 hour)
Pressure range	Max. 10 bar/145 psi	Max. 25 bar/362 psi
Temp sensor	Pt 100	Pt 100
Process connection	Dairy screw (DIN 11851) DN 50	Hygienic mounting adapters: Varivent, Clamp, Dairy screw, DIN 11864, SMS 1145, weld-in
Materials	Converter: PA Sensor: PEEK	Converter: stainless steel (1.4301/304) Display: Polycarbonate Sensor: PEEK Mounting adapters: stainless steel (1.4404/316L)
Installation	Pipe mounting	Pipe mounting
Outputs	2 x 420 mA (active)	2 x 420 mA (active)
Relays	2 x electronic relays floating	2 x solid state relays in the display
Power supply	1931 VDC (24 VDC nominal)	1535 VDC, 150 mA
Certificates	-	EHEDG, 3A

OPTISENS total suspended solids (TSS) sensors



OPTISENS TSS 2000 Optical TSS sensor for wastewater applications



OPTISENS TSS 3000 Optical TSS sensor for wastewater applications OPTISENS TSS 7000 Optical TSS sensor for hygienic applications



Accessories

MAC 100 Liquid analytical transmitter for measurements with sensors of the OPTISENS portfolio



MAC 300 Liquid analytical transmitter for measurements with OPTISENS TSS, pH/ORP and COND sensors



Optical calibration filter 2 AU for OPTISENS TSS 2000 and OPTISYS SLM 2100



Sensor cleaning units for OPTISENS TSS 2000/ TSS 3000

Assemblies



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SENSOFIT IMM 2000 For general water and wastewater treatment applications, telescopic rod holder mounted to handrail

OPTISYS total suspended solids (TSS) measuring systems



OPTISYS TSS 1050/3050 For hygienic applications, process connection G1/2

Several G1/2" process adapters and welding sleeves are available like Varivent[®], Triclamp, Dairy screw DIN 11851



Assemblies

Manual retractable assemblies



SENSOFIT RET 5810 For harsh chemical and water treatment applications, length 107 mm/4.21"

Pneumatic retractable assemblies



SENSOFIT RAM 5830 For hygienic applications in the food, beverage and pharmaceutical industry

Total suspended solids (TSS) sensors and systems



Highlights:

- NIR technology not affected by colouring
- Scratch-resistant sapphire windows (TSS x050)
- Factory calibrated
- Up to 9 points linearisation (TSS 3000/7000 in combination with MAC 300)

Typical applications for OPTISENS TSS 7000 and OPTISYS TSS x050

Food and beverage

- Milk fat concentration measurement
- Separator monitoring
- Fruit pulp monitoring
- CIP control

Process industries

- Quality control and process monitoring in cooling water circuits
- Filtration monitoring

Total suspended solids measurement

The measuring principle

The online measurement of total suspended solids usually follows the transmitted light absorption principle using pulsed near-infrared light (NIR 855 nm). Suspended solids and particles in the sample partially absorb and scatter the light on its way to the detector. The higher the concentration of suspended solids, the weaker is the light intensity reaching the detector.

Light absorbtion method: single beam technology

The simplest method of optical suspended solids measurement is the use of one emitter and one detector. Light emitted from (E) strikes a photocell detector (D) that generates an electrical current. The detector output current is a function of the intensity of the light source (E), the detector characteristics (D), the distance between the light source and the detector (X) and weakening of the light signal by scattering and absorption e.g. through solids.







OPTISYS TSS x050



Alternating light absorption method: 4 beam technology

The two light sources (E1, E2) pulse alternately. At each pulse the light is measured by the 2 detectors (D1, D2). This provides two ratios (X1/X2 and X3/X4) which give an overall ratio. Effectively this principle is therefore measuring the ratiometric change of light, not the actual change. This compensates for build-up of contaminants or degradation of electronics.



Easy to integrate

The TSS sensors also provide immediate results for process control and reduce the need for the time-consuming suspended solids lab analysis. Online sensors are best used after calibration or correlation to the gravimetric TSS procedure. The advantage of using NIR as light source is that this sensor is not affected by the colour of the medium measured.

Typical applications for OPTISENS TSS 2000 and OPTISENS TSS 3000

Wastewater industry

- Open channel or basin installation
- Quality control in industrial and municipal wastewater applications
- Sludge discharge of primary and secondary sedimentation (clarifier) tanks
- Monitoring of biological treatment in wastewater aeration basins
- Product loss monitoring in open channels
- Metal and mining industry
- Final effluent monitoring



OPTISENS TSS 2000



Total suspended solids (TSS) sensors and systems

	Optical TSS sensor for wastewater applications	Optical TSS sensor for wastewater applications	Optical TSS sensor for hygienic applications
	OPTISENS TSS 2000	OPTISENS TSS 3000	OPTISENS TSS 7000
Parameter	Total suspended solids	Total suspended solids	Total suspended solids
Measuring principle	180° absorption light principle, Near infrared (NIR)-LED, single beam sensor	180° absorption light principle, Near infrared (NIR)-LED, four beam self compensating sensor	180° absorption light principle, Near infrared (NIR)-LED, four beam self compensating sensor
Туре	Digital sensor for connection to MAC 100 transmitter	Digital sensor for connection to MAC 300 transmitter	Digital sensor for connection to MAC 300 transmitter
Measuring range	suring range 04AU, 018.5 g/l		025 g/l; 040% milk fat 010 g/l; 020% milk fat 02.5 g/l; 01.5% milk fat
Measuring accuracy	2.5%	±2% of reading	±2% of reading
Temperature range	0+70°C/+32+158°F	085°C/+32+185°	PP: 0+85°C/+32185° PVDF: 0+105°C/+32221°F
Pressure range	1 bar/14.5 psi	10 bar at +25°C/145 psi at +77°F	10 bar at +25°C/145 psi at +77°F
Process connections	none	1 1/4" NPT (male) on cable side	2"/3"Triclamp, Varivent® N
Installation	Immersion	Immersion/Insertion	Insertion
Materials	Stainless Steel (1.4404; 316L), Sapphire glass	Polypropylene (PP)	PP; PVDF
Ingress protection rating	IP68	IP68	IP68
Connector/cable	Attached cable 11 m/36.08 ft	Attached cable 10 m/32.8 ft	Attached cable 10 m/32.8 ft
Options	Immersion assembly air pressure cleaning unit	Immersion assembly air pressure cleaning unit	-
Certificates	-	-	3A, EC 1935/2004, EU 10/2011, EC2023/2006

	Optical TSS / turbidity measuring system for hygienic applications		
	OPTISYS TSS x050		
Parameter	Total suspended solids/ Turbidity		
Measuring principle	180° absorption light principle, Near infrared (NIR)-LED, single beam sensor		
Measuring range	up to 03 AU, 03250 EBC, 26.65 g/l, 013000 FAU		
Measuring accuracy	2.5% of measuring range		
Ambient temperature	-20+70°C/-4+158°F		
Process temperature	+90°C/+194°F (+140°C /+284°F, max. 2 hours)		
Pressure range	10 bar at +60°C/145 psi at +140°F		
Design	Compact; hygienic process connection G 1/2", or PG 13.5 (e.g. for use with retractable assemblies SENSOFIT RAM/ RET 58x0)		
Installation	Insertion		
Outputs	420 mA		
Power supply	1230 VDC		
Relay	PNP transistor, 24 V, NO/NC configurable, max. 150 mA		
Ingress protection rating	IP69K		
Other features	Optical filter set for calibration		
Certificate	EC 1935/2004		

OPTISENS dissolved oxygen sensors



OPTISENS ADO 2000 Amperometric sensor for water and wastewater applications, for immersion and insertion installation



OPTISENS ODO 2000 Optical dissolved oxygen sensor for water and wastewater applications, for immersion and insertion installation

Accessories



MAC 100 Liquid analytical transmitter for measurements with sensors of the OPTISENS portfolio

Assemblies



SENSOFIT FLOW 2000 C/T/Y For water and wastewater applications



SENSOFIT IMM 2000 For general water and wastewater treatment applications, telescopic rod holder mounted to handrail

Dissolved oxygen sensors

OPTISENS turbidity sensors and **OPTISYS** measuring system



OPTISENS TUR 2000 Optical turbidity sensor for water and wastewater applications, for immersion and insertion installation



OPTISYS TUR 1060 Optical turbidity measuring system for potable water applications

Accessories



MAC 100 Liquid analytical transmitter for measurements with sensors of the OPTISENS portfolio

Assemblies



SENSOFIT FLOW 2000 C/T For water and wastewater applications



Calibration Kit for OPTISYS TUR 1060



SENSOFIT IMM 2000 For general water and wastewater treatment applications, telescopic rod holder mounted to handrail

Turbidity sensors and systems

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Amperometric measurement of dissolved oxygen

The measuring principle

The principle of amperometric measurement of dissolved oxygen (DO) was developed by the American Biochemist Leland C. Clark in 1954, who designed the first commercial DO sensor. This sensor is nowadays widely used for instance for wastewater treatment in aeration basins or for fish farming.

The electrode consists of a silver cathode (A) and a lead anode (B), which are connected via an electrolyte (C). Those electrodes are separated from the water by a permeable membrane (D) e.g. Teflon[®] (PTFE). If the sensor is immersed in the medium being measured, such as the biological treatment stage of a sewage plant, oxygen enters the electrode cartridge via the membrane.

The self generated voltage between the silver cathode (A) and the lead anode (B) causes an electrochemical reaction of the oxygen molecules. The measured current (E) is directly proportionallinear to the oxygen concentration. The electrolyte solution (C) contains also some substances which are binding the metall ions occuring when the anode (B) is reacting.



Highlights:

- Self polarising amperometric cell
- Fast response time in all applications
- Integrated temperature compensation for reliable measuring results
- Stainless steel housing for harsh applications
- Longer maintenance intervals due to large electrolyte reservoir
- Easy maintenance via sensor cartridge replacement
- Suitable for connection to the MAC 100 signal converter or as 2-wire loop powered sensor for direct connection to the process control system



Measurement of dissolved oxygen for aeration control at a wastewater treatment plant

Stable measurements with low maintenance and high accuracy

Amperometric dissolved oxygen sensors are widely used in wastewater treatment plants to control and monitor the biological treatment of wastewater.

In these applications, where ragging to the sensors can be caused by hair and fibres and contamination by biofilm often makes precise measurement difficult, OPTISENS ADO 2000 sensors perform outstandingly. Their robust stainless steel housing has a large diameter, which minimises ragging and reduces the need for manual cleaning.

In addition, the large Teflon[®] membrane – abrasion resistant even under severe conditions – as well as the large electrolyte reservoir prolongs service intervals and reduces the drifting of measured values. Through the cartridge system, the whole electrode can be changed easily, enabling fast and easy maintenance.





Typical applications

Water

- Fish farming (fresh water)
- Potable water monitoring

Wastewater

- Controlling biological treatment in wastewaster aeration basins
- Prevention of water pollution

Optical measurement of dissolved oxygen

The measuring principle

An alternative to the amperometric measurement is the optical measurement of dissolved oxygen.

On the inner side of the membrane from the optical dissolved oxygen sensor OPTISENS ODO 2000 an oxygen sensitive layer made of a fluorescent dye (fluorophore) is found. This layer is immobilized due to chemical bonding on the surface of the membrane. The membrane side still in contact with the medium to be measured is oxygen permeable.

The fluorophore is excited by the energy-rich blue light emitted by the LED inside the sensor into an excited state. This energy is emitted from the excited fluorophore after a short period (micro seconds) by emission of low-energy red light (fluorescence). In case an oxygen molecule is getting in contact with the excited fluorophore, a part of the fluorescence is extinguished by the oxygen (fluorescence quenching). In that case the intensity of the red light is decreased.

Consequently, the intensity of the emitted red light is decreased with increasing oxygen content. The intensity of the emitted red light is measured with a light detector. The change in intensity is used to measure the oxygen concentration in the process media. To compensate the intensity drift of the light emitting blue LED its intensity is directly measured with a second light detector.



Highlights:

- No recalibration necessary
- Reliable measurement via fluorescence measurement
- Fast response time in all applications
- No media flow required
- Low cost of ownership
- Less hands-on action

Precise measurements without recalibration

Optical dissolved oxygen sensors are widely used to control and monitor oxygen concentration during the biological treatment of sewage water.

OPTISENS ODO 2000 from KROHNE is especially designed for small and medium-sized wastewater treatment plants, where regular calibration and cleaning of the sensors is difficult due to limited maintenance resources.

OPTISENS ODO 2000's use of the optical principle with a fluorescent dye on the inner side of the oxygen permeable membrane means there is no need of recalibration parts. Precision and reliability remain constant.





Luminophore disc with mounting tool

OPTISENS ODO 2000 measures dissolved oxygen concentration in an aeration basin at a wastewater treatment plant, Stuttgart, Germany



Typical applications

Water

• Fish farming (fresh water)

Wastewater

- Controlling biological treatment in wastewaster aeration basins
- Prevention of water pollution

Turbidity measurement

The measuring principle

In waterworks, a turbidity measurement is used to indicate the clarity of water.

Technically, turbidity is an optical property of water based on the amount of light reflected by colloidal matter and suspended particles. The measuring unit for the turbidity is Nephelometric Turbidity Unit (NTU).

According to ISO 7027, turbidity values below 40 NTU have to be measured with the 90° scattered light method.

The light source and receiver are positioned in a 90° angle to each other. The light transmitted from the source is directed in equal strength to the reference detector and into the medium. Light is now reflected from the particles and fractions of the scattered light are detected by the receiver, positioned at a 90° angle.

The meter now compares the light from the reference detector and scattered light receiver and calculates the turbidity value.



Highlights:

- Precise turbidity measurement
 40 FNU/NTU through the 90° scattered light method
- Measurement according to ISO 7027/US EPA 180.1
- Fastest calibration on market (<5 minutes, OPTISYS TUR 1060)
- Reusable calibration cuvettes for calibration without formazine contact (OPTISYS TUR 1060)
- High accuracy over the complete range due to unique three-point calibration
- Fast response time due to small sample volume (OPTISYS TUR 1060)
- Automated ultrasonic cleaning system (OPTISYS TUR 1060)
- Best price/performance ratio in terms of maintenance and calibration costs



Turbidity measurement for filter monitoring

Calculating turbidity the easy way

Turbidity measurement is widely used in potable water and wastewater applications. To address a wide range of applications, KROHNE offers different measuring solutions, from inline and open channel measurement with the OPTISENS TUR 2000 to low-range measurement systems such as OPTISYS TUR 1060.

OPTISYS TUR 1060 is the best performing turbidity measurement system when it comes to fulfilling all the necessary regulations and requirements. Because of its optimised cuvette measuring system, it has the fastest measuring response time and lowest maintenance requirements on the market.

Typical applications

Water

- Monitoring of potable water quality in pump stations
- Filter monitoring
- Process water treatment
- Controlling of limit values
- Cooling water
- Demineralisation

Wastewater

• Water quality control in the outlet



OPTISENS TUR 2000



Dissolved oxygen sensors

	Amperometric sensor for water and wastewater applications, for immersion and insertion installation	Optical dissolved oxygen sensor for water and wastewater applications, for immersion and insertion installation
	OPTISENS ADO 2000	OPTISENS ODO 2000
Parameter	Dissolved oxygen	Dissolved oxygen
Measuring principle	Amperometric, Clark type	Optical, fluorescence quenching
Туре	Digital sensor with 420 mA current output or for connection to MAC 100	Digital sensor for connection to MAC 100 or 420 mA loop powered
Measuring range	020 mg/l	020 mg/l
Measuring accuracy	±1% of reading	±0.1 ppm at <1 ppm; ±0.2 ppm at >1ppm
Temperature range	Temperature range0+50°C/+32+122°F	
Pressure range	Max. 6 bar/87 psi	6 bar at +25°C/87 psi at +77°F (insertion) 1 bar at +25°C/14.5 psi at +77°F (Immersion)
Installation conditions	Immersion/insertion	Immersion/insertion installation
Materials	Body: stainless steel	PVC
Ingress protection rating	IP68	IP68
Cables	Attached cable 10 m/32.8 ft, 15 m/49 ft	Attached cable: 10 m/32.8 ft; for immersion type also 20 m/65.6 ft or 30 m/98.4 ft
Other features	Integrated temperature compensation; one-point air calibration, exchangeable electrode cartridge	Integrated temperature compensation; membrane life >1 year (not exposed to sunlight); cleaning hose connection

Turbidity sensors and systems

	Optical turbidity sensor for water and wastewater applications, for immersion and insertion installation		Optical turbidity measuring system for potable water applications
	OPTISENS TUR 2000		OPTISYS TUR 1060
Parameter	Turbidity	Parameter	Turbidity
Measuring principle	90° scattered light, Near Infrared (NIR) – LED	Measuring principle	90° scattered light (EN ISO 7027/US-EPA 180.1)
Туре	Digital sensor for connection to MAC 100 or 420 mA	Measuring range	0100 NTU/FNU 01000 NTU/FNU
Measuring range	suring range 0.0014 NTU/FNU, 0.0140 NTU/FNU,		±2% of the measured value below 40 NTU; ±5% of the measured value above 40 NTU
	0.1400 NTU/FNU; measuring range is preconfigured	Ambient temperature	+1+50°C/+34+122°F
	at KROHNE (400 NTU is standard)	Process temperature	+1+50°C/+34+122°F
Measuring accuracy	0.2% f.s. of selected range	Pressure range	7bar/101psi
Temperature range	-5+50°C/+23+122°F	Decign	Duilt-In pressure regulator
Pressure range	6 bar at +25°C/87 psi at +77°F	Installation	Pypage
	1 bar at +25°C/14.5 psi at +77°F (Immersion)	Outputs	1x420mA and RS485
Installation conditions	Immersion/Insertion installation	Power supply	
Materials	PVC	Rolav	2 x relave 120 2/0 V/C
Ingress protection rating	IP68	Netay	free programmable
Cables	Attached cable: 10 m/32.8 ft; for	Ingress protection rating	IP66; NEMA 4X
	or 30 m/98.4 ft	Other features	Reusable calibration cuvettes with traceable liquid standard
Uther features	Cleaning hose connection	Certificate	CE; ETL listed to UL 61010-1 and certified to CSA 22.2 No. 61010.1-12:2012

OPTISYS disinfectant measuring sensor and system





OPTISENS CL 1100 Potentiostatic amperometric disinfectant sensor for water and wastewater applications

OPTISYS CL 1100 Potentiostatic amperometric disinfectant measuring system for water and wastewater

Accessories



Chlorine rapid test kit



Chlorine pocket photometer



Flow limiter

Disinfectant sensor and system

OPTISYS sludge level measuring system



OTPTISYS SLM 2100 Optical sludge level measuring system for sedimentation profile measurement and continuous tracking of sludge blanket

Accessories



Optical calibration filter 2 AU for OPTISENS TSS 2000 and OPTISYS SLM 2100

Sludge level measuring systems

Measurement of disinfectants

Highlights:

- Membrane-free sensor for longterm stability and easy maintenance
- Gel-filled 12 mm sensor for a wide range of applications
- Amperometric measurement with fast response time
- Automatic sensor cleaning for extended maintenance intervals
- Measuring system with integrated pH compensation

The measuring principle

The amperometric sensor has three electrodes: a measuring electrode (gold), a counter electrode (gold) and a reference electrode (Ag/AgCl).

A precise potential is built up between the measuring and the reference electrode. The measuring electrode starts polarising and negative charges collect close to the measuring electrode. After polarisation, the electrical current decreases to 0 mA as long as the polarising layer is not changed. Free chlorine molecules that hit the surface of the measuring electrode take a defined portion of the charge with them, changing the status of the measuring potential.

The converter constantly measures the potential between the measuring and reference electrode and immediately readjusts the potential as soon as it begins to change. The current needed to maintain a constant potential is directly correlated to the free chlorine concentration in the measuring medium. The measurement of chlorine dioxide or ozone follows the same principle.



Self-cleaning sensor with extended lifetime

For easy handling, KROHNE offers you OPTISYS CL 1100 – a complete pre-wired and tested disinfectant measuring system including all the necessary components for measurement and compensation as well as a quick and cost effective installation.

The unique combination of the membrane-free OPTISENS CL 1100 sensor and the automatic cleaning system of the OPTISYS CL 1100 means extremely low maintenance.

Even the most persistent coating is no problem, which adds up to an extended product life.

The disinfectant signal will be compensated by the integrated temperature measurement under all process conditions. The disinfectant measuring system can also manage pH compensation for free chlorine and will handle the complete free chlorine range, even at higher pH values.

Combine the OPTISYS CL 1100 with our OPTISYS TUR 1060 turbidity measuring system and you have the best solution for pumping stations.



OPTISYS CL 1100 for monitoring water quality

Typical applications

Water

- Monitoring potable water quality
- Disinfection control
- Process water treatment
- Emergency chlorination for potable water

Wastewater

• Monitoring limit values in industrial effluent

Measurement of sedimentation profile

The measuring principle

Unlike the commonly used ultrasound level measurement, the KROHNE sedimentation profile and sludge blanket meter is using an optical sensor which travels through the media. Thus it can directly measure the suspended solids concentration at different heights.

The measurement of the suspended solids content is based on the method of the absorption of light, which provides precise measurement results independent of the sludge colour. The direct measuring principle excludes incorrect measurements due to echo returns from walls or separating zones as well as signal damping by fluff or floating sludge.



- Direct measurement by immersion of optical sensor
- No interference with fluff or floating sludge due to direct measurement
- Reliable measurement of the sedimentation profile as well as sludge blanket and fluff levels
- Continuous level measurement of sludge blanket (zone tracking)
- Common operating and service concept with flow and level devices
- Low maintenance due to cable wiper and automatic flushing of sensor and cable after each measuring cycle
- Rake guard switch protects the sensor from being catched by the rake
- Build in heater for outdoor installations
- Durable stainless steel sensor and instrument enclosure
- Reliable signal transmission from sensor, due to digital communication via optocoupler





Sludge blanket measurement in secondary clarifier of wastewater treatment plant, Krefeld, Germany

A clear view right to the ground

OPTISYS SLM 2100 goes right down to the bottom of a tank and detects all sludge phases, supplying precise concentration and level measurements.

Via the zone tracking function you can follow one specific concentration (i.e. the sludge blanket) and hence continously monitor one specific "zone", for instance for controlling the pumps during de-pumping of the sludge.

You even have the option of recording a sludge profile, enabling you to detect sedimentation problems early and prevent sludge being washed out to the next stage.

Typical applications

Water

 Monitoring of sedimentation processes and automated de-pumping in sedimentation basins

Wastewater

- Prevention of sludge washout in primary and secondary clarifiers
- Control of sludge settlement and automated extraction of sludge in clarifiers and sludge thickeners

Disinfectant and sludge level measuring systems

	Potentiostatic ampero- metric disinfectant measuring system for water and wastewater		Potentiostatic ampero- metric disinfectant sensor for water and wastewater applications		Optical sludge level measuring system for sedimentation profile measurement and continuous tracking of sludge blanket
	OPTISYS CL 1100		OPTISENS CL 1100		OPTISYS SLM 2100
Parameter	Free chlorine (Cl ₂), chlorine dioxide (ClO ₂),	Parameter	Free chlorine $[Cl_2]$, chlorine dioxide (ClO_2) , ozone $[O_3]$	Parameter	Sludge blanket and fluff level
Measuring principle	Potentiostatic amperometric	Measuring principle	Potentiostatic amperometric	Measuring principle	180° absorption light principle, Near infrared (NIR)-1 FD
Design	Mounted on panel	Туре	Ø12 mm/Ø0.5"; length: 120 mm/4.7"	Design	Compact measuring system
Measuring range	Cl ₂ : 0.0320 mg/l ClO ₂ : 0.055 mg/l	Measuring	PG 13.5		with KROHNE HMI and immersion sensor
Amhient	0 ₃ : 0.055 mg/l -15 +55°C/+5 +131°E	range	ClO ₂ : 0.055 mg/l O ₃ : 0.055 mg	Measuring range	010m/033 ft (0.130 g/l)
temperature	0 +50°C/+32 +122°E	Process temperature	-5+70°C/+23+158°F	Ambient temperature	-20+50°C/-4+122°F
temperature	IP45	Materials	Glass shaft, gold electrodes, EPDM gasket	Process temperature	0+60°C/+32+140°F
protection	11 00	Diaphragm	Ceramic	Ingress	IP68 (sensor), IP55 (elec-
Min flow rate	30 I/b	Min. flow rate	30 l/h	rating	(cable drum compartment)
Min. conductivity	200 uS/cm	Min. conductivity	200 µS/cm	Measuring	1. Profile measurement
Pressure range	Max. 6 bar/87 psi at +20°C/+68°F	Pressure range	Max. 6 bar/87 psi at +20°C/+68°F	modes	(height and concentration) 2. Sludge blanket and fluff level
Installation	Bypass in flow-through installation	Installation	Flow-through installation only		3. Zone tracking (continuous measurement)
Outputs	3 x current output	Response time	<20 seconds	Outputs	2 x current output
· .	(420 mA)	Connector	M12		[420 mA]
Power supply	100230 VAC, 24 VAC/DC	Features	Automatic sensor cleaning	Power supply	230 VAC
Relays	3 relays			Relays	3 relays
Features	Status and calibration logbook, temperature and pH compensation, automa- tic sensor cleaning (ASR)			reatures	built-in heater, ventilation, switchable height and depth measurement, automatic change of measuring mode, flush cleaning unit for sensor and cable (optional), wiper for cable cleaning (optional)

Analytical transmitters

	Liquid analytical transmitter for measurements with sensors of the OPTISENS portfolio	Liquid analytical transmitter for measurements with OPTISENS TSS, pH/ORP and COND sensors	
	MAC 100	MAC 300	
Parameter	pH/ORP, conductive and inductive conductivity, Cl ₂ , ClO ₂ , O ₃ , dissolved oxygen, turbidity, total suspended solids	pH/ORP, conductive conductivity, total suspended solids	
Туре	Wall and pipe mounted	Wall, pipe and panel mounted	
Housing	Die-cast aluminium field enclosure (IP66/67) Stainless steel housing (IP66/67/69K)	Plastic, IP66	
Display	Graphic display, 128x64 pixels	Multifunctional-QVGA- LCD-display	
Inputs	1 or 2 sensor inputs	Up to 3 sensor inputs	
Ambient temperature	-15+55°C/+5+131°F	-20+50°C/-4+122°F	
Relays	3 relays	Up to 6 relays	
Power supply	100230 VAC, 24 VAC/DC	85265 VAC/DC, 1832 VAC/DC	
Outputs/ communication	3 current outputs (0/420 mA)	Up to 6 current outputs (0/420 mA); Modbus optional	
Approvals	-	-	
Features	Status and calibration logbook, control input (e.g. hold function, flow alarm)	Data logging, live trending software, SD card slot	

SMARTPAT operating/control units and accessories

	Operating unit for on-site calibration and configuration of SMARTPAT sensors	Universal control unit for 420 mA/HART® field devices	Multiparameter indicator for analytical and other parameters	Junction boxes for connecting SMARTPAT sensors to control systems and HART [®] devices	USB interface cable for offline calibration and configuration of SMARTPAT sensors
	SMARTMAC 200 W*	SHD 200*	SD 200 W/R*	SJB 200 W*	OPTIBRIDGE*
					000
Parameter	pH/ORP, conductive conductivity	420 mA/HART® signals	pH/ORP, conductive conductivity, temperature, concentration, turbidity, pressure, level	All 420 mA signals; connection point for HART® communication tools	HART [®] signals
Туре	Wall and pipe mounted	Wall and pipe mounted	Wall or rack mounted	Wall mounted	-
Housing	Die-cast aluminium (IP66/67) Stainless steel (IP66/67/69K)	Plastic and aluminium	Plastic Wall mounted: IP67 Rack mounted: IP65	Plastic enclosure: IP65 Aluminium enclosure: IP66	Stainless steel: IP65
Display	Graphic display, 128x64 pixels	Graphic display, 256x128 pixels	LCD	-	-
Input	1 sensor input	1 sensor input	1 sensor input	1 sensor connection	-
Ambient temperature	–1555°C/+5+131°F	-20+70°C/-4+158°F	-30+80°C/-22°F+176°F -30+70°C/-22°F+158°F (Ex)	Plastic enclosure: -20+55°C/-4+131°F AISi 12 enclosure: -40+65°C/-40+149°F	0+55°C/+32+131°F
Relay	-	2 relays	-	-	-
Power supply	420 mA, loop powered	420 mA, loop powered	420 mA, loop powered	-	Via USB
Outputs/ communication	420 mA/HART® 7 (loop powered)	420 mA/HART® 7 (loop powered) + additio- nal 420 mA output	420 mA (loop powered)	-	HART [®] 7
Approvals	ATEX, IECEx, QPS	ATEX, IECEx, QPS	IECEx, ATEX, CSA	ATEX, IECEx, QPS	IECEx, ATEX
Features	Full configuration and calibration of SMARTPAT sensors, status and calibration logbook	Control unit for 420 mA/HART® field devices, trend graph, summary page, NAMUR NE 107 signali- sation, USP <645>, full sensor access by internal HART® adapter	-	SJB 200 W-Ex suitable for installation in hazardous area	OPTIBRIDGE is used for all 2-wire loop powered HART [®] devices

Insertion mounting assemblies

	Manual retractable assembly for harsh chemical and water treatment applications	Automatic retractable assembly for harsh chemical (RAM 5810) and hygienic (RAM 5830) applications	Manual retractable assembly for harsh chemical (RET 5810) and hygienic (RET 5830) applications	Insertion assembly for analytical sensors in process applications	Insertion assembly for hygienic applications in the food, beverage and pharmaceutical industry
	SENSOFIT RET 5000*	SENSOFIT RAM 5810/5830	SENSOFIT RET 5810/5830	SENSOFIT INS 1000/1310	SENSOFIT INS 7311/7312
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Sensor/ assembly type	Ø12 mm/Ø0.5"; length: 120 mm/4.7" PG 13.5 sensor connection	Ø12 mm/Ø0.5"; length: 225 mm/8.9" PG 13.5 sensor connection	Ø12 mm/Ø0.5"; length: 225 mm/8.9" PG 13.5 sensor connection	Ø12 mm/Ø0.5"; length: 120 mm/4.7" PG 13.5 sensor connection	Ø12 mm/Ø0.5"; length: 120 mm/4.7" PG 13.5 sensor connection
Materials	Stainless steel (1.4404/316L)	Stainless steel (1.4404/316L)	Stainless steel (1.4404/316L)	Stainless steel (1.4404/316L); SENSOFIT INS 1000 also PP, PVDF	Stainless steel (1.4404/316L)
Sealing materials	PTFE, EPDM, FPM and/or FFKM	FPM, EPDM (FDA/USP VI) or FFKM	FPM, EPDM (FDA/USP VI) or FFKM	FPM, EPDM (FDA/USP VI) or FFKM	EPDM (FDA/USP VI), FPM
Pressure range	Static: up to 12 bar/ 174 psi at +130°C/+266°F Dynamic: up to 4 bar/58 psi (non-Ex); up to 2.5 bar/36 psi (ATEX version)	Up to 16 bar/232 psi and +140°C/+284°F	Up to 16 bar/232 psi and +140°C/+284°F	INS 1000: up to 12 bar/174 psi at +140°C/+284°F INS 1310: up to 10 bar/145 psi at +140°C/+284°F	Up to 10 bar/145 psi at +140°C/+284°F
Process connection	Flanges DN32, DN50 PN16 Flanges ASME 1 1/4", 2" 150 lb Threads G 1 1/4" male, 1 1/4"NPT male	RAM 5810: Flanges DN32, DN40, DN50 PN16; ANSI 2" 150 lb RAM 5830: G1 1/4 (DN25) Ingold connection	RET 5810: Flanges DN32, DN40, DN50 PN16; ANSI 2" 150 lb RET 5830: G1 1/4 (DN25) Ingold connection	INS 1000: NPT 3/4 or 1" INS 1310: G 1 1/4 (DN25) Ingold	Tri-Clamp 1-1.5" (OD 50.5 mm); Tri-Clamp 2" (OD 64 mm); VARIVENT DN40-125
Insertion length	2 insertion rod versions: Up to 300 mm/11.8" Up to 700 mm/27.5"	RAM 5810: 107 mm/4.2" RAM 5830: 70 mm/2.8"	RET 5810: 107 mm/4.2" RET 5830: 70 mm/2.8"	INS 1000: 25 or 50mm/ 0.99" or 1.97" INS 1310: 70 mm/2.8"	40 or 45 mm/ 1.57"or 1.77"
Cleaning connection	G1/8", G1/4", 1/4"NPT as option	G1/8, 1/4"NPT	G1/8, 1/4"NPT	-	-
Certificates	Material certificate 3.1 EN 10204, certificate for elastomer EPDM (FDA/USP VI)	Material certificate 3.1 EN 10204, certificate for elastomer EPDM (FDA/USP VI)	Material certificate 3.1 EN 10204, certificate for elastomer EPDM (FDA/USP VI)	Material certificate 3.1 EN 10204, certificate for elastomer EPDM (FDA/USP VI)	Material certificate 3.1 EN 10204, certificate for elastomer EPDM (FDA/USP VI)
Other features	Ball valve (option), flexible sensor immersion depth, cleaning connection (option)	With position switch, cleaning connection	With cleaning connection	Protection cage (as option for INS 1310)	-

*also available with Ex approval $\langle \widehat{\mathtt{Ex}} \rangle$

Immersion mounting assemblies

	Immersion assembly for up to 3 sensors for installation in open basins	Telescopic rod immersion assembly for different sensors for installation in open basins	Immersion assembly for installation in tanks and open basins	
	SENSOFIT IMM 1000	SENSOFIT IMM 2000	SENSOFIT IMM 2920	
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Sensor/ assembly type	sor/ mbly type 012 mm/00.5"; length: 120 mm/4.7" PG 13.5 sensor connection, or G 1/2" 012 mm/00.5"; length: 120 mm/4.7" in combination with SENSOFIT INS 1000; 0PTISENS OD 2000; 0PTISENS TUR 2000; 0PTISENS TSS 2000; 0PTISENS 2000; 0PTISENS 2000; 0PTISENS 2000; 0PTISENS 2		Ø12 mm/Ø0.5"; length: 120 mm/4.7" PG 13.5 sensor connection, or NPT 3/4"	
Materials	PP	Stainless steel (1.4301/304) Fiberglass, POM	PP	
Sealing materials	EPDM	EPDM	EPDM, FPM	
Pressure/ temperature range	Pressureless, up to +90°C/+194°F	Pressureless, up to +60°C/+140°F	Max. 4 bar/58 psi; 0+80°C/0+176°F	
Process connection	Clamp (wall) or handrail mounting	Handrail mounting	Suspended holder; Flange DN50, PN16; Flange ANSI 2" 150 lb	
Insertion length	Approx. 1000 mm total length	Flexible: 1.64 m/5.3513.1 ft total length	1 or 2 m/3.3 or 6.6 ft	
Cleaning connection	-	Depending on sensor type	6/4 mm hose	
Other features	-	-	Spray cleaning (optional)	

Flow-through assemblies

	Flow-through assembly for chemical and water treatment applications		Flow-through assembly for water and wastewater applications		
	SENSOFIT FLOW 1000 T	SENSOFIT FLOW 1000 Y	SENSOFIT FLOW 2000 C	SENSOFIT FLOW 2000 T	SENSOFIT FLOW 2000 Y
				6	
Sensor/ assembly type	G 1 1/2" for OPTISENS IND 1000	Ø12 mm/Ø0.5"; length: 120 mm/4.7" PG 13.5 connection for pH, ORP or Chlorine sensor; G 3/4" for conductive conductivity sensors	For use with optical oxygen and turbidity sensors OPTISENS ODO and TUR 2000 (inline versions)	For use with optical oxygen and turbidity sensors OPTISENS ODO and TUR 2000 (inline versions; TUR 2000 > 40 NTU only)	For use with ampero- metric oxygen sensor OPTISENS ADO 2000
Materials	PP	PP	PVC	PVC	PVC
Sealing materials	FPM	EPDM	EPDM	EPDM	EPDM
Pressure/ temperature range	10 bar/145 psi and up to +90°C/+194°F	10 bar/145 psi and up to +95°C/+203°F	6 bar/87 psi and up to +50°C/+122°F	6 bar/87 psi and up to +50°C/+122°F	1 bar/14.5 psi and up to +50°C/+122°F
Process connection	DN 32, DN 40, DN 50 weld connection	G 1" female thread	6/4 mm or 8/6 mm hose connection	1 1/2" cemented socket connection	DN 50 cemented socket connection

Consumables

Overview buffer and reference solutions	
Parameter	Solution
рН	рН 4
	рН 7
	рН 10
ORP	220 mV
	465 mV
Conductivity	0.015 mS/cm
	0.147 mS/cm
	1.413 mS/cm
	25 mS/cm
Dissolved oxygen	Sodium sulfite
Turbidity	100 NTU
Sensor cleaning	Pepsin
	Thiourea
Storage and regeneration of pH and ORP sensors	3 M KCl

Supply of spare parts and consumables

- Various calibration solutions
- Cables in various lengths
- Spare parts and consumables for OPTISYS measuring systems etc.





Communication at KROHNE: Open for the future

Industrial automation in the process industry has been undergoing rapid change for the past twenty years. This has also affected industrial measurement technology.

Where centralised and largely self-contained structures once dominated, today the pace is set by intelligent, decentralised architectures. So, system concepts in which the products of a variety of manufacturers work harmoniously together are a reality via open, standard interfaces such as HART[®], PROFIBUS[®] and FOUNDATION[™] fieldbus.

KROHNE has been actively following this development for years, whether we are talking about flow measurement, level measurement, temperature measurement or analytical measuring technology. All KROHNE field devices are open for the future. They communicate reliably with asset management systems, control systems and PCs and can also be used for a variety of control and regulating tasks.





Integration is a top priority at KROHNE

KROHNE field devices meet all of the prerequisites for integration into modern plant asset management systems, based on integration technologies such as DD/EDD and FDT/DTM.

What's so special about FDT/DTM? For the first time, it makes open, bus-independent integration of field technology into a plant asset management system a reality.

This is without a doubt a milestone for industrial communication and KROHNE, a long-standing member of PACTware and the FDT group, has played and continues to play a significant role. So it is no wonder that we have made DTMs available for our field units with HART[®] and/or PROFIBUS[®] interfaces since the beginning of 2003.



Services – At your side, every step of the way

Services for the entire project life cycle

- Consultancy and engineering Pre-sales support starting at the planning phase through to final quotations and technical details
- Start up and commissioning Commissioning services including 24h telephone hotline as part of a Service Level Agreement
- Calibration and validation Periodic inspection, validation, recalibration and revamp service, including environmental and metrological certification
- Operation and maintenance Scheduled maintenance, emergency response, remote support and spare parts management
- Training and workshops Starting from online training courses through to tailormade in-house trainings

Ever since KROHNE started producing variable area flowmeters in 1921, service has been a vital part of our business and how we connect with our customers. Now a global market leader in process instrumentation and measurement solutions, we have developed a sophisticated service concept that covers all aspects of the entire life cycle of a process plant. Our services encompass all project stages and are available for all enterprise sizes.

With a local presence in around 100 countries, service is typically available from just around the corner. To deal with complex questions, the local service organisation is in direct contact with KROHNE knowledge centre and manufacturing organisation.


Product related services

Whenever KROHNE instrumentation is installed, we will be there to provide the best possible service, from on-site analysis and workflow recommendations through to the installation and commissioning.

- On-site planning
- Meter calibration and verification
- Rental service for e.g. ultrasonic clamp-on flowmeters
- Flexible warranty arrangements from simple warranty extensions of single instruments up to a full project
- Exchange service, e.g. local recertification or meter exchange
- Repair
- Service hotline and remote service
- Support on offshore facilities incl. instrumentation upgrades and retrofitting
- Field service incl. renewal of local custody transfer approvals (e.g. in acc. with MID)
- Revamps

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Large team of field service engineers and technicians



Rental service

Solution related services

KROHNE offers a comprehensive service package for the entire life cycle of its solutions. From design concept, the consideration of legal requirements i.e. for custody transfer or functional safety loops, to on-site commissioning and support.

- Support with the creation of planning documentation (tenders, diagrams, communication)
- Custody Transfer (CT) support
- CFD simulations
- Scope planning and definition
- Cost estimates and budgets
- Planning of quality standards and risk identification
- Start-up assistance
- FAT / SAT support
- Plant / Site audits
- Calibration service
- Meter verification
- On-site support
- Offshore support
- Service Level Agreements (SLAs) consisting of: - Spare parts management
 - Emergency response and on-site repair
 - Maintenance, remote support
 - 24/7 service hotline



Engineering services for complete metering solutions



Meter verification



Training – From online courses to tailormade workshops

KROHNE Academy and Service Academy

KROHNE Academy is a series of seminars organised in collaboration with leading automation companies. Taking place in various countries, it addresses key operating issues, from plant safety to ways of increasing efficiency and controlling costs, and highlights possible solutions. Should your interest be more towards working "hands-on" with our devices, then our Service Academy is what you are looking for.

KROHNE Academy online

KROHNE Academy online is an online eLearning platform focusing on industrial process instrumentation. It comprises electronic training courses with full audio, explaining measuring technology without relating it to specific manufacturers and live webinars. Register now for free and start your training at <u>academy-online.krohne.com</u>

Tailormade workshops

To fully address individual training needs, KROHNE organises tailormade training sessions at any time, virtually anywhere in the world. All aspects starting from device-specific courses or legal aspects relating to custody transfer metering or functional safety (SIL) are covered.



Functional safety seminar at KROHNE headquarters, Duisburg, Germany

Service, configuration and ordering tools – Little helpers with a big impact

myDevice – Smart service tools

myDevice is the new tool suite tailored to the needs of users and operators of KROHNE process instrumentation. It comprises a number of smart service tools for the complete life cycle of a measuring point and ensures

- Simple and quick device commissioning
- Field device verification incl. test reports
- Monitoring and trend analysis
- Convenient management of all device-specific assets
- Knowledge transfer through online training courses and tutorial videos

krohne.com/mydevice

Configure It – Online selection and order platform for complete KROHNE quotations

- Easy selection of any spare part needed
- Integration into specific portal or marketplace
- CAD models (IGES / STEP, DWG) of most KROHNE devices for e.g. direct import into virtually any CAD system

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Visit <u>krohne.com/mydevice</u> and learn more about:

- OPTICHECK Mobile, DTM, Master
- Wireless parametrisation and commissioning of field devices
- Verification with highest test depth without process interruption
- Reliable information on device health
- Detailed reports for proof test documentation of safety loops (IEC 61508, 61511)
- PICK Product Information Center
 - Device-specific assets via serial number or AutoID acc. to DIN SPEC 91406
- ICV Videos
- Step-by-step video tutorials
- KROHNE Academy online -24/7 online course availability





KROHNE – Products, Solutions and Services

- Process instrumentation for flow, level, temperature, pressure measurement and process analytics
- Flow metering, monitoring, wireless and remote metering solutions
- Engineering, commissioning, calibration, maintenance and training services



Contact

Head office: KROHNE Messtechnik GmbH Ludwig-Krohne-Str. 5 47058 Duisburg Germany Tel.: +49 203 301 0 Fax: +49 203 301 103 89 info@krohne.com

Global companies and representatives The current list of all KROHNE contacts and addresses can be found at: www.krohne.com